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The Reparations Question.

THE question of payments in kind now being made by Germany to France has lately been discussed with some anxiety by the French technical industries and accordingly in the technical Press. The Frenchman has complained for many years that, although victorious in the war, he has been vanquished in the peace. During the last two or three years France, as we have already shown, has effected a wonderful improvement in her financial and industrial conditions, and she has advanced this improvement to an extent which has surprised even her most enthusiastic supporters. It can, however, be well imagined that it is annoying to home manufacturers directly connected with industries concerned to see that payments in merchandise due to France under the Dawes plan rose from barely 8,500 tons in 1927, worth 73 million francs, to over 28,500 tons in 1928, worth 225 million francs, while future payments of this character will still be very considerably augmented. But while the electrical, mechanical, and metallurgical industries in France are said to be those which have been most severely affected by these payments in kind, it is useful to observe that the 28,500 tons last year amounted to only 38 per cent. of the total importations of machines and worked metal received from Germany during that year, the remainder having been imported voluntarily.

Our correspondent in France says that the various French ministries and government departments are endeavouring to absorb as much of this material as possible, and other large consumers are acting wisely in purchasing these goods and in taking advantage as far as possible of the favourable financial arrangements which are conceded. But when this is done there are cries of alarm that these German supplies, by reducing the value of the demand for national products, must ruin the country. It would be far more profitable to everyone if, instead of receiving these payments in manufactured goods, the payments could be received in specie or in

bullion, and that thus all the allied countries would be able to employ their own national industries in making the articles at home. Particularly may this argument be adopted by those nations which are unable to find employment for their skilled workmen. It is to be regretted also, if true, that by means of these payments in kind Germany is able to manufacture on a large scale, to reduce her cost of production, to compete more successfully in other markets, and perhaps to establish herself in the commercial position in France which she occupied before the war.

Our correspondent states that, as far as France is concerned, it is admitted in competent circles that these German deliveries have rendered it possible, apart from reparations, to carry out many important public works which to-day would otherwise be still awaiting a beginning. It is equally certain that there are still many other undertakings, required urgently for public service, which cannot be started because of lack of funds. It is in such directions that payments from Germany in kind should help France to put her house in order at a greatly reduced capital expense and without inflicting any harm on national industries.

Readers who are really interested in this question should read a leading article appearing in the *Times* of August 15th, from which we make the following extracts regarding the Hague Conference :—

"The problem of deliveries in kind is, of course, of special importance to British industry, which has been affected adversely in two distinct ways by this form of Reparations. The consignment to the various creditor countries of large stocks of commodities, such as coal, which might otherwise have been purchased in this country, has naturally exercised a directly depressing effect upon the particular trades in question. But the damage to British industries has by no means confined to the direct effect of these deliveries; a large number of contracts covering a great variety of goods have been concluded with German firms by private individuals, especially in France, of which only a portion has been on Reparation account, the remainder being a purely private transaction. Thus, continues the *Times*, to take an example from the electrical industry—one of our industries which have been most notably affected—in the construction of a hydro-electric plant, a French contractor may purchase a portion of the machinery which he requires from Germany by way of reparations, and this action may practically compel him to buy the remainder from German firms, because they alone supply the specification suited to the part of the plant he has already obtained in this manner. The effect of the deliveries in kind is thus to stimulate German exports in those markets where they naturally compete most strongly with British goods to an extent which is wholly disproportionate to their actual volume."

The position of France is of course quite different from that of this country, seeing that she has employment for all, while with us unemployment is our most pressing problem. It will be remembered by most of our readers how loud an outcry was heard when it was proposed here that we should accept part of Germany's payments in the form of big electrical power stations, railway electrification works, and so forth. The Government of the day listened to the appeals of the Institution of Electrical Engineers and other leading electrical institutions and associations and the strong views of the Technical Press concerning our own rights and needs and thus secured the placing of large contracts with the British electrical industry during the past few years. No doubt they are carefully watching the situation now developing in order to secure that national efforts to reduce unemployment are not rendered nugatory by accepting payments in kind in the form of manufactured electrical and allied products.

The British Association in South Africa.

On a later page we give the first section of the report received from our special commissioner regarding the transactions of the British Association for the Advancement of Science in Cape Town, Johannesburg, and Pretoria. Of the papers read before Section G (Engineering), four are of major interest to electrical engineers, namely, those by Sir Charles Parsons, Prof. E. W. Marchant, Mr. C. H. Merz and the president of the Section, Prof. F. C. Lea. The address by Sir Thomas Holland as president of the Association (abstracted elsewhere in this issue) will also have an interest, though of a more indirect kind, in that it relates the possession and use of mineral resources to political pre-eminence; since minerals form so large a proportion of engineers' raw materials, and their possession becomes a national asset only if the engineers of the country are able to develop their use.

Prof. Lea's address relates to the inter-dependence of the engineer and the scientist. The engineer owes most of his basic data to the research work of the scientist, but has repaid this debt by testing the soundness of mathematical theories.

Present-day heavy electrical engineering owes so much of its position to the steam-turbine that the account of its recent progress given by one whose genius made it a practical success, must be of value to those engaged in power station development. Of topical interest also are Prof. E. W. Marchant's address on the limits of the economical transmission of electrical power, and Mr. C. H. Merz's address on the national scheme of electricity supply in Great Britain.

Prof. Marchant makes out a better economic case for the transmission of electricity compared with the transport of coal than has generally been accepted hitherto, but it is quite in accord with experience in other ways that the case for electricity should be progressively revised in its favour. Mr. Merz not only describes the constructional features of the "grid," but also gives a useful historical summary of the events in the electricity supply industry that led up to the passing of the 1926 Act, and also an estimate of the result of meeting the entire fuel requirements for domestic purposes by electricity. We propose dealing with these three addresses at greater length in a subsequent issue.

Equipment Protection in Explosive Atmospheres.

We publish elsewhere in this issue a description of the electrical installation recently put down at the cleaning works of Messrs. Achille Serre, Ltd., in connection with their newly adopted dry-cleaning plant. The equipment embodies a method of overcoming the difficulties of running motors, switchgear, and so on, in explosive-mixture laden atmosphere, which, we suggest, might be extended in other fields of application. All the electrical equipment in the "danger zone" is totally enclosed, and the moving portions operate in air pressure (on the plenum system) at a small pressure—8 in. water gauge. The scheme, of course, involves the use of auxiliary plant, such as the necessary blowers and pipe line, in addition to the means for interlocking the air and electrical systems. Rough comparison between the benzine-laden atmosphere at Messrs. Achille Serre's works and the explosive mixtures found in coal mines would suggest the success of the system in the latter. Much time and money has been spent in research to find the "ideal" explosion-proof motor, and judging from expert opinions which have been publicly expressed, there is considerable divergence as to the merits of the various methods.

A possible objection to the use of the "air-pressure" system of protection in coal mines is the long lengths of air-pipe line which would be required. While, of course, the expenditure involved must be an important deciding factor, there is no doubt that the primary consideration in coal-mine working is safety. An initial expenditure of a few pounds on equipment might easily result in the saving of considerable amounts of money in respect of the elimination of accidents. Judging, however, from the actual cost figures for the Achille Serre installation, the expenditure involved would not be serious. We understand that the cost of the pipe line and blowers is less than what would have been the extra cost for installing flame-proof motors. Actually the costs for the complete electrical installation (including switch and control gear) and for the pipe line and blowers are, respectively, £4,000 and £240. It appears then that consideration of the scheme would be worth while.

We congratulate Messrs Newtons, of Taunton, and Messrs. Watford Electric and Manufacturing Co., Ltd., on the success of the scheme at Walthamstow.

Electricity in Dry Cleaning.

The electrical installation employed for the new Hatfield process of dry cleaning at the factory of Messrs. Achille Serre, Ltd., embodies a method of entirely overcoming the difficulty of running motors in explosive-mixture laden atmospheres.

THE electrical installation recently put down for the new Hatfield process of dry cleaning at the works of Messrs. Achille Serre, Ltd., at Walthamstow, presents some particularly interesting features, chief among which is the satisfactory method by which the motors and control gear are safely run in a benzine-laden atmosphere.

The dry-cleaning installation is designed to deal with 200 tons of clothes, &c., per week.

Briefly, the dry-cleaning system involves treatment of the soiled articles in a suitable grease solvent (chiefly benzine) in Serre-Alliott hydro-extractor type washers, the dirty solvent being cleaned in special filters and passed directly back to the washers in an enclosed system. The solvent filters are of the high-pressure, quick-discharge type, with leaves or screens of monel metal. The diagram of the Hatfield cyclic process in fig. 5 will serve to give an idea of the principle of the system. The washers are 6 ft. in diameter, and the revolving portion of each is divided into four compartments, which are loaded at one end of the machine. By means of a suitable air-tight door the machine is placed under vacuum, and the spirit is then admitted at the top and taken out at the bottom. After the necessary cleaning period the solvent supply is cut off, and the machine is run at a higher speed under vacuum in connection with a recovery

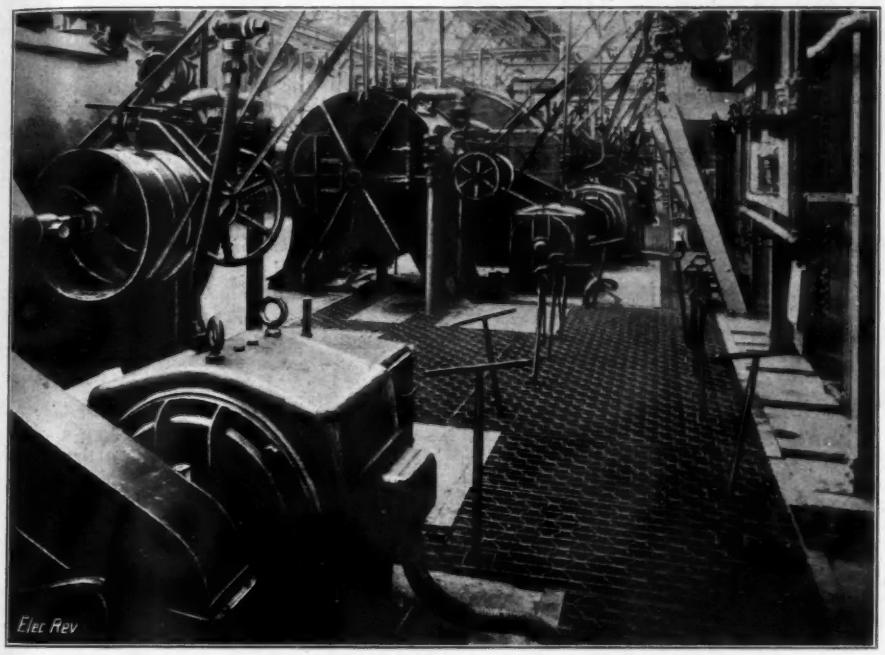

Fig. 1.—Back View of Washers, showing Hydro-ing Motors.

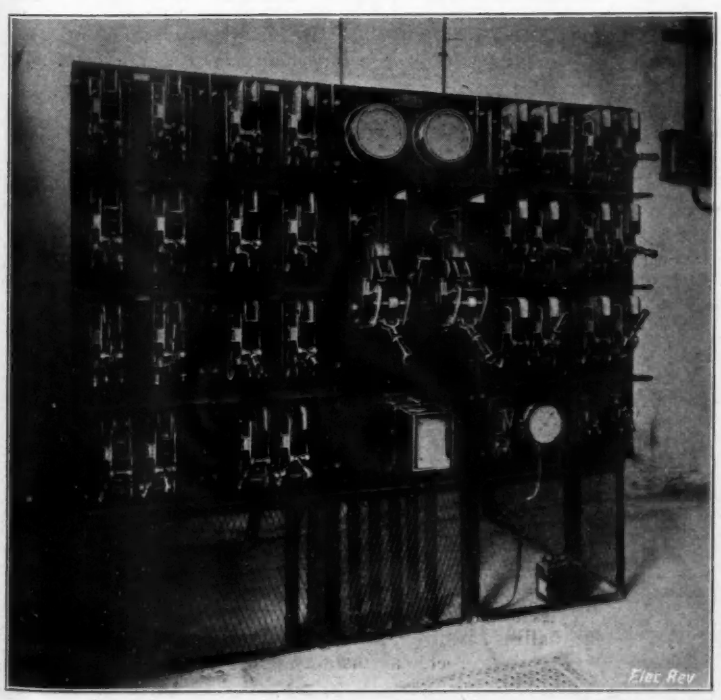

Fig. 2.—Dry-cleaning Switchboard; Air and Electrical Interlocking Equipment at bottom right.

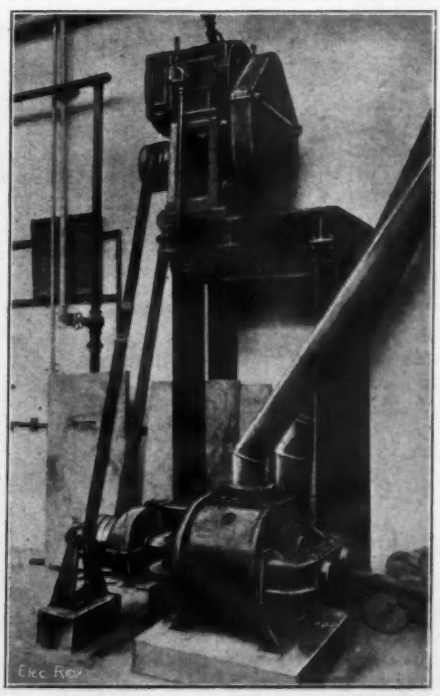

Fig. 3.—Recovery-plant Motor-driven Blower.

plant to avoid waste by spray and vapour drawn from the machine. Fig. 3 shows the motor-driven blower which passes the gases from the washers through the recovery plant. The motor is of 3 h.p., 950 r.p.m.

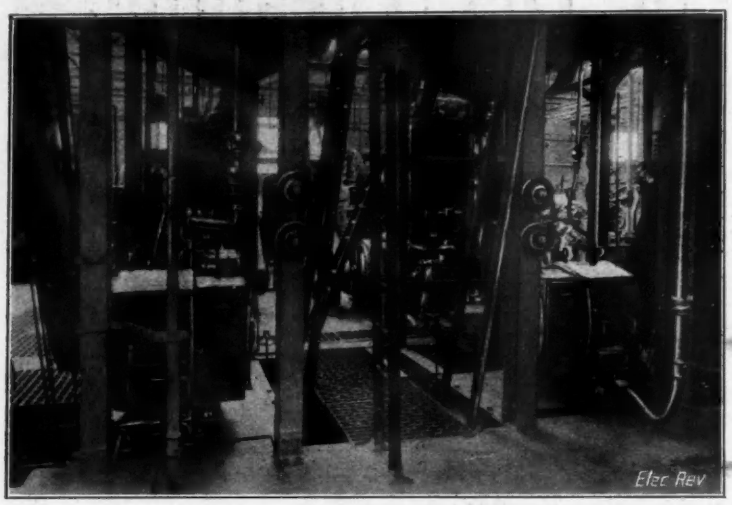

Fig. 4.—Pair of Line-shaft Motors.

Fig. 1 is a back view of the washers, showing the hydro-ing motors, while fig. 4 depicts a pair of line-shaft motors.

Separate motors serve for the two operations of the washers. For the cleaning process the washers are required to run at a speed of 16 r.p.m., reversing five times a minute, and are driven from a line-shaft to a system of fast and loose pulleys, through a suitable train of reduction wheels, with mechanically operated gear for reversing the washers. The vacuum pumps, mixer, proportioning chambers, and circulating pump are also driven from the line-shaft. The motor for this duty is rated at 35 h.p. at 900 r.p.m. Transmission to the line-shaft is by a Hans Renold duplex bush roller chain, ratio 3:1. Lubrication for the chain is provided by a small pump and oil sump, mounted near the chain case.

For the hydro-extracting process, it is necessary to run the washer at a speed of 420 r.p.m. For this operation individual motors are used for each washer; the motors are rated at 30/75 h.p. at 900 r.p.m. Transmission to the washer is by means of a duplex bush roller chain, ratio 2:1, approximately. Lubrication of the chain is provided by a small pump and oil sump, mounted near the chain case and driven from a small pulley wheel fixed on the motor armature-shaft extension. After the clothes are cleaned and taken from the washer, they are placed in drying tumblers and dried by a draught of hot air and tumbled until the spirit solvent left in the clothes is completely dried off. A battery of six tumblers is driven by a 30-h.p. Newton motor.

All the motors used in the dry-cleaning shop are totally enclosed, watertight, and fumeproof. As already indicated, the outstanding feature of the installation, from the electrical point of view, of course, is the protection afforded against electrical sparking in the benzine-laden atmosphere, and in this connection great credit is due to Messrs. Achille Serre; to Messrs. Newtons of Taunton, who supplied the motors specially designed for the job; and to Messrs. Watford Electric and Manufacturing Co., Ltd., who similarly supplied the control gear; for their whole-hearted co-operation, which brought the scheme to complete success. All the motors and switchgear actually employed at the washers are totally enclosed, and the moving portions operate in air at a small pressure — 8-in. water gauge (plenum system). Two Keith Blackman multi-vane blowers driven by ½-h.p. "Newton" motors provide the air pressure, one blower acting as a standby. The motor and switchgear cases are connected through a suitable system of air pipes. The air-pressure system is interlocked with the main supply circuit by means of a pressure gauge and a relay. Should for any reason the blower shut down or the air pressure fall, the pointer of the gauge disconnects the relay, which,

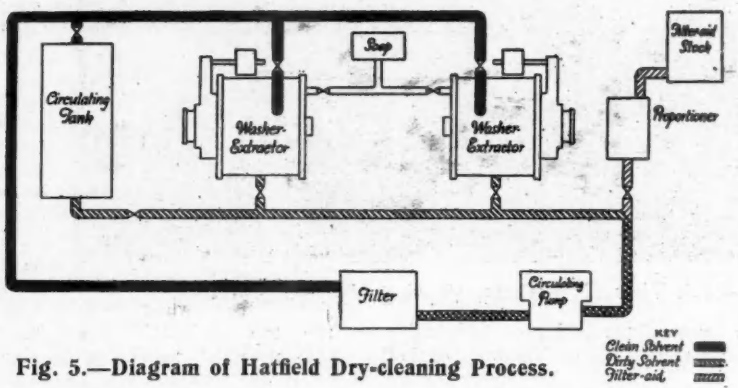

Fig. 5.—Diagram of Hatfield Dry-cleaning Process.

Fig. 6.—Line-shaft and Hydro-ing Motors Control Boards.

in turn, open-circuits the no-volt coil of the main circuit breaker, thereby shutting down the motors. The gauge and relay may be seen at the bottom right of the switchboard shown in fig. 2.

The actual control equipment for the motors is housed in a separate room away from the washers. The four controllers on the left of fig. 6 are for use with the line-shaft motors and are remote controlled from the motor position by means of suitable start and stop push-button stations. The four controllers on the right of fig. 6 are used with the eight hydro-ing motors, one controller operating two motors. These controllers are operated from the master switch-controls shown in fig. 9, the change-over switches being mounted beneath the control push-button stations. These change-over switches isolate both motors from the controllers in the neutral or centre positions.

By means of auxiliary contacts on the drum of the change-over switch, the motor circuit is broken at the line contactor in the controller, thus ensuring that no sparking at the main drum contacts of the change-over switch takes place, and similarly that the main connections are made first and the line contactor circuit subsequently completed.

Protection against starting a hydro motor whilst the machine is washing is provided by a single-pole switch, which closes the circuit on the line contactor of the controller. This switch is operated from the transfer lever on the washer. This protective feature was designed by Mr. G. Kovach, engineer to Messrs. Achille Serre, Ltd. Fig. 9 is a front view of the washers showing the master controllers.

Fig. 7.—Spotting Room, depicting "Sheringham" Corrective Lighting Units.

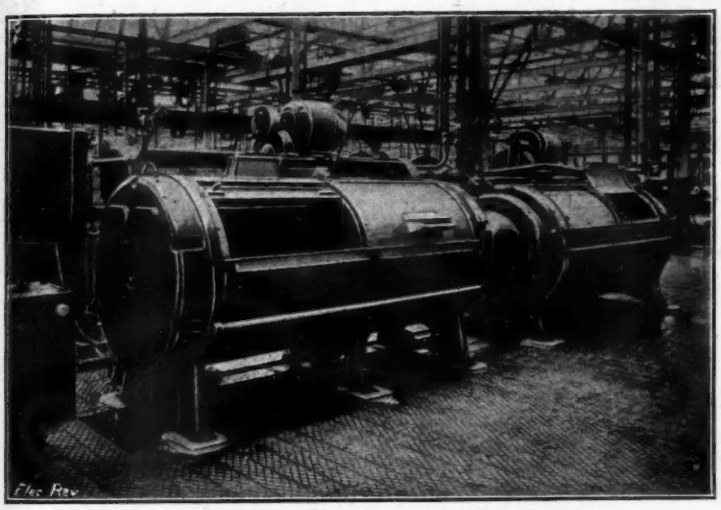

Fig. 8.—Wet-cleaning Machines; 5 h.p. Motors.

In the control rooms are the main switchboard, fig. 2, for the dry-cleaning department, four control panels for the four line-shaft motors, fig. 6 left, and four control panels for the eight hydro-ing motors, fig. 6 right. The hydro motors each have a starting load of approximately 75 b.h.p. for a period of two minutes, the output then dropping to about 15 b.h.p. when the motor is at full speed. The starting resistance is cut out by means of contactors; these close under the control of the "Watford" patented master rheostat, which is fitted with an eddy drag retarder having a series coil and hold-on brake. This rheostat makes the circuit for the contactors successively, while as each contactor closes and the current rises, the hold-on brake stops the rheostat and prevents further motion until the current falls to a pre-determined value, when it again operates and

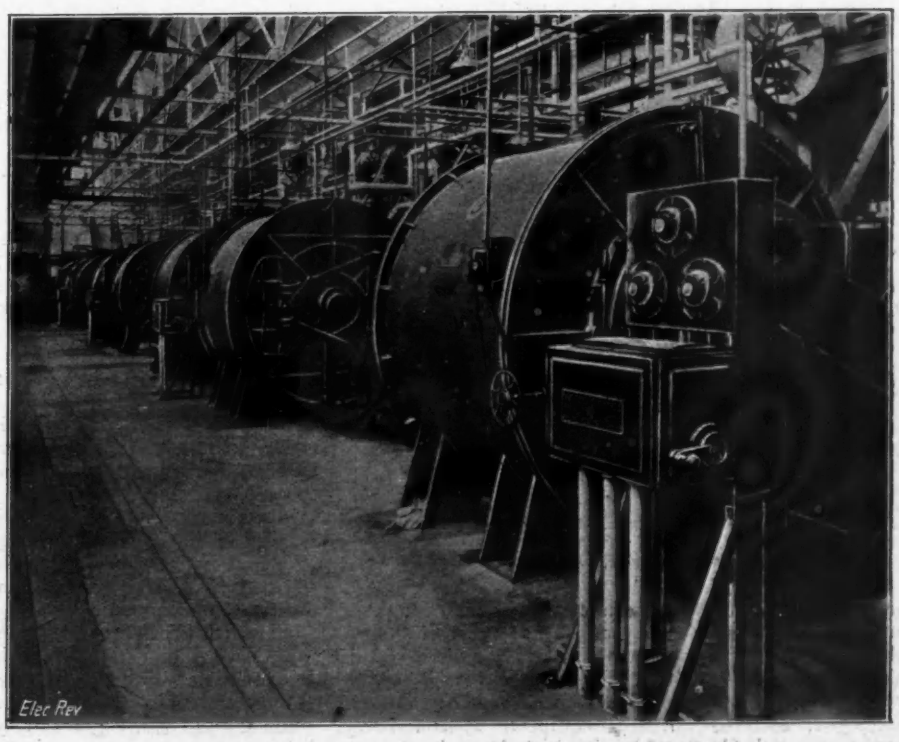

Fig. 9.—Front of Washers, showing Master-Controllers.

permits the next contactor to close. The control panels are standard equipment of the Watford Company, the controller being fitted with a s.p. contactor fitted with arc shields and a magnetic blowout; the armature resistance

Fig. 10.—Main Factory Switchboard.

is cut out in 6 steps in the correct sequence, under the control of the eddy drag retarder. An interesting feature in the control room is a small panel for controlling the dirty-spirit pumps. The motor is started up by a float switch operated by the spirit in the receiver, and is shut down when the pressure in the discharge line falls to a pre-determined value.

Fig. 10 shows the main switchboard for the whole of the factory. The supply is received from the Walthamstow Urban District Council at 460 V, d.c., at which pressure practically all the energy for power is supplied throughout the works.

Considerable wet cleaning and other operations, such as calendering, spot cleaning, and so on, are carried out in addition to the dry-cleaning process described above. Fig. 8 shows some of the machines in the wet-cleaning department. The motors mounted on top of the machines are of 5 h.p., and the washers will deal with a ton

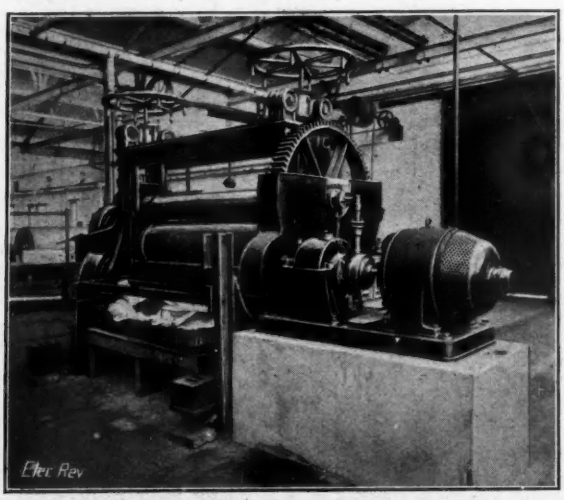

Fig. 11.—Calendar, showing 10 h.p. Motor.

each of clothes per day. The motors run at 1,000 r.p.m. and the machines at 16 r.p.m. The success of "spot cleaning" depends almost entirely on efficient and suitable lighting. Fig. 7 is a view in the "spotting" room, depicting the Sheringham Corrective fittings employed, each of which is equipped with a 75-W ordinary gasfilled lamp. Lighting is similarly important in the inspection department, which is equipped with Sheringham fittings and 300-W lamps.

Fig. 11 shows a 40-ton calendar which is employed for such operations as glazing blinds. The driving motor (B.T.-H.) is 10 h.p. and runs at 1,100 r.p.m. The drive is through special reduction gear by Messrs. Power Plant Co., Ltd., the machine speed being 55 r.p.m. Contactor equipment with push-button control is provided for start, inch, stop, and reverse.

In the upholstery room there are 25 machines each driven by an $\frac{1}{8}$-h.p. motor. The motors are so compounded that they accelerate very quickly, and each one is protected by a 1-A fuse. There are two blanket- and curtain-drying rooms equipped, respectively, with a 7- and a 5-h.p. motor driving a Sturtevant fan on an enclosed air system.

Considerable electrical energy is used for driving all descriptions of conveyors, and electric trucks are employed for running throughout the works. A battery-charging room for the truck batteries is equipped with standard gear. An 80-line Siemens automatic telephone board serves for intercommunication throughout the works.

The entire electrical installation was, and erection of the drives, carried out by Messrs. Achille Serre, Ltd.'s own staff, under the supervision of Mr. Kovach.

In conclusion, we are indebted to Messrs. Achille Serre, Ltd., for permission to inspect the plant and take photographs, and to Messrs. Newtons of Taunton, Messrs. Watford Electric & Manufacturing Co., Ltd., and Mr. Kovack for their assistance in the collection of the above information.

The dry-cleaning plant and the filtration process, which are described above, were invented by one of the directors of Messrs. Achille Serre, Ltd., Mr. A. E. Hatfield, and is licensed by the patentees.

The St. Lawrence Waterway.

Destructive criticism of the extensive international project to deepen the St. Lawrence to allow ocean-going vessels to reach the Great Lakes, and to develop hydro-electric power by the construction of barrages, is contained, according to *Financial News*, in a book issued by the Institute of Economics of the Brookings Institution of Washington. This book, entitled "The St. Lawrence Navigation and Power Project," after a close study of the scheme, sets forth the conclusion that from the standpoint of the shipowner, the taxpayer and the public the project is neither economically sound nor feasible. The cost of the scheme is roughly estimated at $1,000,000,000 (£200,000,000), of which $614,000,000 (£122,800,000) is attributable to navigation and $385,000,000 (£77,000,000) to power development. These figures are much in excess of previous estimates. Annual overhead charges assignable to the navigation side of the accounts are estimated on the most conservative basis at $36,000,000 (£7,200,000).

It is found that a channel 33 ft. deep would be required in place of the 27 ft. channel hitherto suggested. As to whether the highest type of shipping would be attracted to the route the book is decidedly sceptical. Analyses are given of the chief items of potential traffic, such as grain and flour, lumber, pulp and paper, coal, petroleum, fertilisers, machinery, motor vehicles, food products, and basic raw materials. The final estimate is that 10,500,000 short tons of traffic might use the waterway, assuming that it were brought to completion in the year 1940. Relating traffic to annual overhead charges, a cost per ton of traffic is found, which exceeds the likely saving in transportation charges.

The power phases of the project are treated in a report by the engineering firm of Sanderson and Porter. The Institute of Economics finds that it would be impossible to market St. Lawrence power in large distant communities in the United States in competition with power from other sources. Also there are not at present, either on the United States or the Canadian side of the river, industries of a kind and magnitude able to absorb the great amounts of power which would be available.

Electricity in Holland.

A few impressions of, and comments on, the way electricity is produced, distributed, and used by the Dutch.

By JOHN H. MORTIMER.

MY first impressions of Dutch electrical methods were decidedly bad. As a good and well-behaved electrical engineer I *should* have been shocked, because for *all* purposes, including mains services and in the finest of the Dutch banks, brazed conduit with light slip (not even pin-grip) fittings are used!

In Amsterdam the general method of distribution is at 220 V, 3-phase, on the delta system, but in the new residential quarter now in the course of creation the star system is being used exclusively. The electricity works distribute at 10,000 volts to non-rotary sub-stations, which re-distribute at 3,000 volts to feeder pillars, and thence at 220 V on to the network.

There is no overhead distribution whatsoever, which is distinctly surprising when it is realised that it is only necessary to probe down one metre below the surface, even in the middle of the city, to find free water. In fact, I was told that it was proposed to dig up one of the streets as a canal would be more convenient!

Realising the significance of the ever-present water and the general method of installation in Holland, which does not call for any earthing or bonding, it gave me considerable food for thought on being told that, although every one of the 751,000 inhabitants is served with electricity, in Amsterdam not one fatal accident (indeed, not one accident worth reporting) has taken place in the last nine years due to faulty electrical conditions.

Comparisons, I know, are supposed to be odious; but nevertheless I can see no other way to achieve the object of this article but to compare English and Dutch methods.

In Holland the supply company's one idea is just to sell as many kWh as possible at the cheapest possible price. They seem to study, with sound commonsense and with remarkably few rules, how cheaply an installation can be carried out. On the completion of an installation no megohm tests are made: first, because there is no earthing and bonding to test, and, secondly, because they realise that in new buildings everything is so damp as to make insulation-test records a farce. A representative visits the job, looks around, tries one or two switches, and if things *seem* satisfactory the connection is made. I asked what they would expect to happen if the installation was a cheap and bad one and soon became defective (as we *sometimes* hear about in this country!) The reply was that it would have to be renewed and would cost the owner such a lot more in trouble and money than if it had been done properly in the first instance that people appreciated the wisdom of thorough work.

There is no equivalent in Holland to the E.C.A., or National Register, although I believe the supply authorities are conferring just now with a view to creating such an organisation. In any case, there seems to be the maximum of co-operation between contractors and the supply company. The latter will not undertake any wiring work at all; they never charge for making a service available; and, apparently, are agreeable to the service position being in the most convenient place in the building, such location being decided by the tenant or owner. I know this statement will take a deal of believing, but it is true!

The Dutch people allow their cables to carry about 50 per cent. more current to the square inch than do we, and they are not very particular how many points are wired in a circuit. The unwritten rule is 12 points per circuit of any wattage, but if more are required by the consumer, the contractor counters by pointing out the foolishness of, proverbially speaking, "putting all one's eggs in one basket" in the event of a fuse blowing.

I must admit that, slack though this attitude may appear to be, it places an onus on the consumer, the architect, and the contractor, which induces far more careful consideration of these important matters than do our somewhat overwhelming Rules and Regulations. The latter seem to me to lull us into a sense of false security, from which our Dutch friends are entirely free. I do not, for one moment, suggest that we should do away with our Rules, but I do feel that we need to realise that they cannot always rigidly be applied, and that in addition to them co-operation is vitally necessary, so that they may be obeyed in spirit oftentimes rather than in letter.

In one flat that I visited in the City of Amsterdam, one of a block of about 200 that are being erected, I found that at the supply company's service position was a single-pole "Z"-type fuse and joint box (the service being only on one phase, the neutral not being fused). From this fuse only the wiring went direct to the lighting, heating, and geyser points, looping from one to the other just as and when most convenient. The equipment of outlets in the flat consisted of 11 lighting points, five heating points, and two electric storage geyser points.

Their method of charging for electricity is decidedly progressive. The basis is an agreed assessment, and so much per kW afterwards; the lighting, power, and heating energy passing through one meter. By the way, their meters incorporate a timed change-over switch that operates a second set of dials, so that the cheaper rates available are actually recorded direct for the evening and night time, and also at luncheon time when the factories are shut down. The time switch is, of course, electrically controlled and operated in conjunction with the master clock in the generating station.

The English attitude, compared with the Dutch, is to make the installation as *safe* as possible, regardless of cost, for, in addition to the Rules and Regulations of the I.E.E., supply companies are permitted to make their own rules, and in many cases have no compunction whatever in stating that a particular load required is just a nuisance to them. Again, in this country charges (I write *charges*) are made to the consumer by the supply company for bringing in the main cables—an expense the consumer is compelled to meet and yet for which he buys absolutely nothing. In case any of our worthy supply gentlemen wish to tell me the old, old story about buying "Electrical Service," may I anticipate them with another anecdote entitled "Hobson's choice." However, I have not picked up my pen in order to "strafe" our supply authorities; but, frankly, I feel that our Dutch friends can give them points in encouraging the use of electricity.

I was very interested in the Amsterdam Supply Company's "strict" (*sic*) control over the temporary electrical installations for buildings in the course of erection. All such buildings seem to be equipped with temporary installations, because so many electrical appliances are used by building contractors. It caused me no little amazement to see a chalk-mixing machine driven by an electric motor, the whole equipment being "dumped" in the middle of a field. There was no attempt at earthing, in spite of the fact that the labourer operating it stood continuously in a puddle of water. The starter (I should like to have brought it back with me) once had a complete slate top and on it were mounted the starting handle and three bare brass nuts and bolts. The latter formed the means of connecting up a 3-phase, 380-V motor, and the starting handle moved to within an inch of these terminals.

So far as installation work is concerned, apart from the observations I have already made, it is very interesting to note that for all internal wiring single-strand cable, capable of carrying 20 amperes, is always used. On this basis the tubing is first installed and when the building work is more or less completed the wires are *drawn* in. Yes, in Holland they must have very skilful electricians! and it is surprising that a fully qualified man only gets paid 75 cents = 1s. 3d. per hour.

The Dutch do not know of Trade Unions, and think the position in England in this respect just ludicrous. Over there overtime work is paid for at additional rates, but there are simply no restrictions on how much overtime may be worked. It is apparently no crime for an electrician to give a carpenter a hand, or assist a painter in some useful way. I admire the industry of the Dutch worker tremendously, and the general attitude of co-operation can only lead to prosperity all round.

As a very keen and enthusiastic member of the electrical fraternity I look forward to the day when not only the English electrical trade will be more closely knit together with the one common aim in view of extending the serious usage of electricity, but also when we, by aggressive propaganda, can make the man in the street go to his registered contractor for more plug outlets and appliances as the obvious solution to the domestic problems that at present lead him in and out of servants' employment bureaux.

Labour Exchanges and Unemployment.

Is the Ministry of Labour performing its proper functions or merely acting as a dole-paying institution?

By H. C. PARSONS, F.I.S.A.

NOT many years ago the Government then in power created the Ministry of Labour in an endeavour to provide work for people out of employment. There were many who regarded the creation of this new department as somewhat of a blunder, involving as it did a certain amount of Government interference with industry. Their criticism does not appear to have been far wrong, for to-day we have a huge organisation, spread all over the country, which is dependent for its very existence on the absence of the thing it was created to provide. The Ministry of Labour appears, on the surface, to be fast becoming simply a huge cashier's department for the payment of unemployment benefit, and a statistical department for the issue of statistics, which are somewhat misleading, regarding the number of unemployed and the cost-of-living index.

When any matter of national importance is taken up politically, it tends to become very much exaggerated and its real meaning overlooked. Used as an electioneering weapon to influence votes for the party with the most alluring promises, it more often than not leaves the voter quickly disillusioned. Unemployment would almost seem to-day to mean nothing more than the qualification for insurance, and not " absence of work " from whence it was derived. We are to-day saddled with two Cabinet ministers whose duties must, to a very large extent, overlap, namely, the Minister of Labour proper and the Lord Privy Seal. Surely two are not necessary, or is it that the Ministry of Labour has ceased to function as an Employment Exchange? Whilst not decrying for one moment the present Government's efforts to increase employment, and having in mind the promises of other political parties, it certainly seems that as a provider of employment the Ministry of Labour has ceased to exist. Until quite recently the employment figures issued by the Ministry were exceedingly misleading, and liable to misinterpretation in interested countries abroad. Even now, though qualifying notes are added, the figures do not give a true aspect of the situation. Included in the weekly figures are seasonal and casual workers, many of whom have never in their lives been in a regular job, seamen and some dock workers, workers on short time, and boys and girls who have just left school. All these swell the number of unemployed, but do not truly show the state of real unemployment caused by trade depression with which it is primarily associated.

Passing for a moment from unemployment to the cost-of-living figure, this ignores the fluctuating prices of milk, butter, bread, bacon and other staple foods of the artisan, and gives us figures based on cheap foods which of necessity have to be purchased by the poorer classes—mainly unemployed. These figures therefore are very misleading, and should not be used to regulate wages as they frequently are. It is a very debatable point whether the cost of living is not now higher than it has been for some time.

Reverting again to the functions of the Ministry of Labour as associated with unemployment, some such organisation is of course necessary for the registration of unemployed and the distribution of the unemployment insurance, but whether such a vast organisation is necessary for purely routine work is one for discussion. Most trades have their own papers in which vacancies are advertised, and the daily papers are also well used for the same purpose. If labour exchanges functioned properly, such advertisements should not be necessary.

When considering the problem of unemployment, it must also be borne in mind that there are other factors besides trade depression which affect the question, namely, trade union rules and taxation, the latter having a very direct effect on expansion and development in many industries. If taxation could be reduced by half, more than half our unemployed would vanish, and whilst the revenue would be directly reduced, it would be of a temporary nature, as part of it would come back through the increased spending power of the community in a very short period; whether the present Government can do anything in the nature of such an experiment is very problematical, as its revenue is already earmarked.

Much can be done, however, if the money can be found for public utility work, such as the electrification and modernisation of the railways, road making, the development of road transport, &c. Such works directly improve the cycle of trade, and being of a productive nature do not mean that the money is spent with no prospect of its effect on unemployment in trades not directly engaged in those works.

Unemployment is a canker that will do more towards the downfall of a nation than any other thing, bringing as it does in many cases poverty and despair, the fertile ground for agitators and enemies of the State. It reduces the morale of honest people to crime and wantonness. We must therefore do what we can to ensure that the Government handles the matter in a satisfactory way, and does not allow things to be manipulated for political reasons. There will always be a certain number of unemployed persons, but so long as this is limited to a few thousands, poverty will be reduced, rates and taxes will come down considerably, and the general welfare of the nation will be much advanced.

Earth Faults on Three-phase Systems.

The Calculation of Distribution of Short-circuit Currents.

By C. G. CARROTHERS, B.Eng., A.M.I.E.E.

THE calculation of the short-circuit currents resulting from faults on alternating-current systems is greatly simplified if a direct-current equivalent can be found for the plant and lines in circuit with the fault. The direct-current equivalent also allows the general question of the distribution of current to be considered, with all the different factors that influence the result in sight, and provides a basis for the design of a simple model from which results can be obtained by experiment.

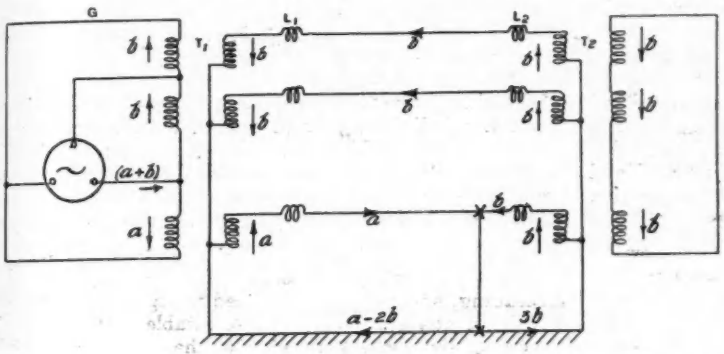

Fig. 1.

If the faults are between phases, the direct-current equivalent can be obtained fairly simply, because the resulting short-circuit currents lie entirely within the normal conducting paths of the system, the reactances of which are constant and can be determined.

If the faults are between one phase of the system and earth, the resulting short-circuit currents contain components that circulate through channels of indefinite reactance that lie partly outside the normal conducting paths. The reduction of the system to an equivalent direct-current network is therefore complicated, because it is necessary to separate the components of current that circulate within the system from those that circulate partly outside it, so that resistances appropriate to the reactance of their paths may be inserted.

The development of the direct-current equivalent for earth faults can be illustrated by means of the simple case shown on fig. 1, which represents a three-phase line connecting the terminals of the star-connected windings of two star-delta transformers, each having a solidly earthed neutral. An alternator is connected to the terminals of the delta-connected windings of the transformer at the left-hand end of the line. One of the phases is short-circuited to earth at X/X. The letters G, T_1, L_1 and T_2, L_2 represent the impedance of the generator and of the transformers and line to the left and right of the fault, respectively. The currents due to the fault are denoted by small letters and arrows. A transformation of one to one is assumed and normal load currents are neglected. Current is fed to the fault from the alternator by two paths :—

(1) Current marked *a*, by direct transformation from the alternator on to the earthed line.

(2) Current marked *b*, by transformation from the generator on to the two sound lines in parallel, from the two sound lines on to the corresponding limbs of the delta winding at the far end of the line, and from the remaining limb of the delta winding on to the right-hand end of the earthed line.

If we assume for the moment that the impedance of each line is the same to all currents, whatever their return path, then the three-phase circuit in fig. 1 can be replaced by a direct-current model as shown in fig. 4. The circles with letters inscribed denote resistances representing the impedances of corresponding portions of the three-phase circuit. The resistances of the sound lines and the limbs of the transformers connected to them are doubled, because the two limbs (owing to their series-parallel connection) form a single-phase transformer of ratio 2 to 1.

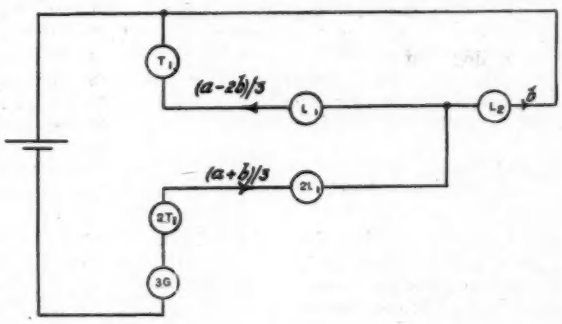

Fig. 2.

The currents in the two sound phases are equal to each other in magnitude and direction, because of the phase coupling of the delta windings; current therefore flows between only two terminals of the alternator, so that the letter *a* represents the impedance of the alternator to a short-circuit between two terminals.

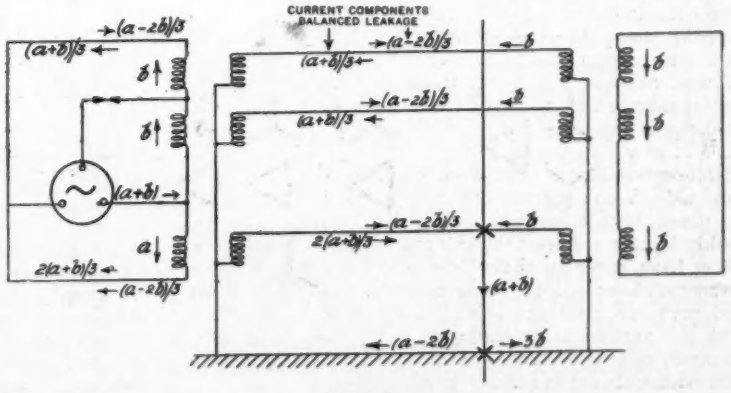

Fig. 3.

In fig. 3 the three lines are shown with the current split up into the following components :—

To the left of the fault position—

(1) A single-phase current $(a-2b)$ enters through the neutral connection of the transformer at the left-hand end of the line. It divides itself equally between the three phases into three equal parts $(a-2b)/3$. It approaches the fault position along the three lines in parallel and returns from the fault position to the neutral connection of the left-hand transformer by way of earth.

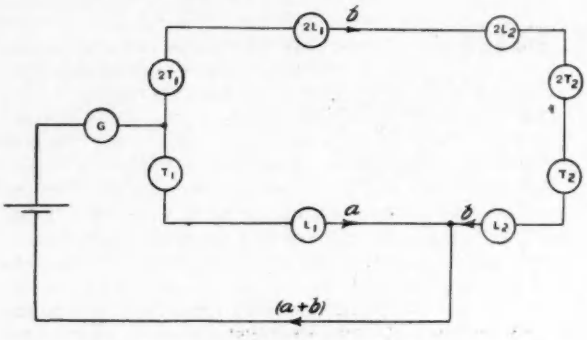

Fig. 4.

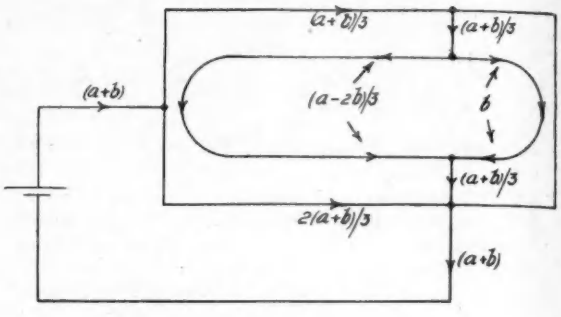

Fig. 5.

(2) A single-phase current $(a+b)/3$ approaching the left-hand transformer from the fault position along each of the two sound phases and returning from the transformer to the fault position along the earthed phase with a combined value of $2(a+b)/3$.

To the right of the fault position.—A single-phase current $3b$ enters through the neutral connection of the transformer at the right-hand end of the line. It divides itself equally between the three phases into three equal parts b. It approaches the fault position along the three lines in parallel and returns from the fault position to the neutral connection of the left-hand transformer by way of the earth.

The current in the line is thus divided into components belonging to two main classes as follows :—(i) " Leakage currents " divided between each of the three phases in equal parts with common earth return, and (ii) " balanced currents " that traverse only the normal conducting channels of the system. Class (ii) can further be subdivided into two symmetrical three-phase components with opposite phase sequence, but this is not necessary in the case of any non-rotating apparatus, because its reactance to three-phase current is independent of the direction of phase sequence, so that the reactance of each line to a single-phase current that returns by way of the other two in parallel is such that the impedance voltage bears the same relation to the current as it would under symmetrical three-phase conditions.

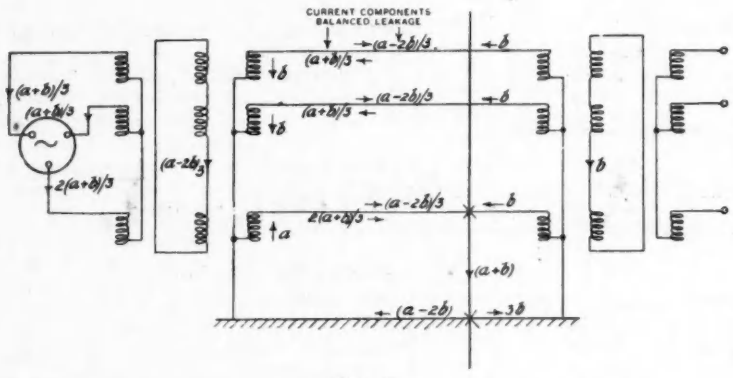

Fig. 6.

In fig. 5 the currents in the different sections of the direct-current model are shown split up into components corresponding to the leakage and balanced components in fig. 3. In terms of these components the total voltage opposed to the battery due to the current through resistances G, T_1 and L_1 in fig. 4 may be written

$\{[G(a+b)+(T_1+L_1)\,2(a+b)]/3\}+(T_1+L_1)(a-2b)/3$, or

$(3G+2T_1+2L_1)(a+b)/3+(T_1+L_1)(a-2b)/3$, or

since $(T_2+L_2)b$ equals $(T_1+L_1)(a-2b)/3$

$(3G+2T_1+2L_1)(a+b)/3+(T_2+L_2)b$.

It is therefore possible to obtain values for $(a+b)/3$ and $(a-2b)/3$ by means of a model, as illustrated in fig. 2, consisting of resistances of the values marked in the circles and connected up as shown to a battery of the same voltage as that applied to the circuits of fig. 4.

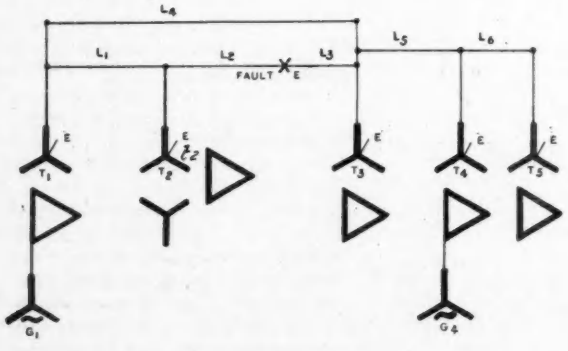

Fig. 7.

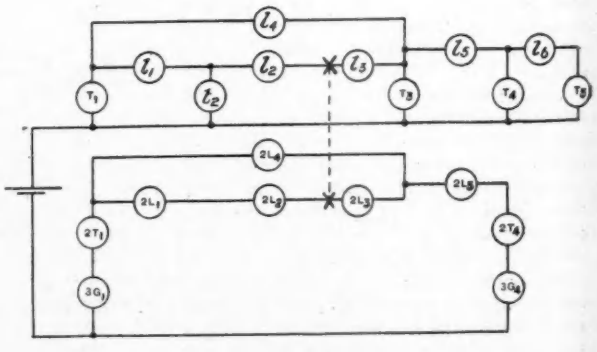

Fig. 8.

Although the results obtained by the two models are the same, there is an important difference between the distribution of current in the branches of the models. In fig. 2 the leakage currents $(a-2b)/3$ and b appear separately from each other and from the balanced current $(a+b)/3$. It is therefore possible to adjust the values of the resistances in circuit with the leakage currents to take account of the reactance of the lines to leakage current.

The reactance of the three lines in parallel to a single-phase current with an earth return may be three, or more, times as great as that of one line to the same value of balanced current. The reactance of each of the three lines will be three times that of the three lines in parallel, so that the values of L_1 and L_2, where they are in circuit with the leakage current, may have to be multiplied by 10. This is equivalent to assuming a depth of return path of leakage current of about 2,000 ft. below the surface of the earth for normal spacing of conductors.

The single-phase impedance of each limb of the transformers is independent of the current in the other limb, so that the reactance to leakage current is the same as the reactance to balanced current. If there is any appreciable impedance in the neutral connection, a resistance should be inserted in circuit with the leakage currents in fig. 2 to correspond with three times its value. The neutral connection carries the leakage component of the currents in each of the three phases and, as the leakage currents are equal in magnitude and direction, the impedance voltage is three times that due to one of them by itself.

For star-star tertiary-wound transformers the impedance to leakage current of each phase is that of the limbs connected to the line to the corresponding limb of the closed tertiary.

If fig. 2 is used for two interconnected stations with star-star tertiary-wound transformers, the values found for the balanced and leakage currents can be transferred to the actual diagram, as shown on fig. 6. The current supplied by the generator is $\frac{2\,(a+b)}{3}$, so that in place of the $3G$ in fig. 2 a figure should be taken equal to twice the generator reactance to a single-phase current through two limbs in parallel and in series with the third.

The method applied to the above simple circuits can be extended to more complicated networks. Fig. 7 shows a system of interlinked transforming stations with different types of apparatus connected at each. Fig. 8 is the diagram of the model to represent it, corresponding to fig. 2. The balanced and leakage components found from fig. 8 are transferred to fig. 7 exactly as in the simpler case.

Besides being a simple method of calculating current values, or finding them by experiment, an equivalent diagram, such as that shown in fig. 8, shows at once the following characteristics of the system under earth fault conditions :—

(1) The relative distribution of balanced current is almost exactly as it would be with a fault between phases at the same position as the earth fault.

(2) The relative distribution of leakage current depends only on the line and transformer reactances, and is independent of the synchronous plant connected.

(3) Increased reactance of the lines to leakage current concentrates the leakage current to sections of the line adjacent to the fault.

The British Association.—I.

A general account of the meeting of the British Association for the Advancement of Science at Cape Town, South Africa.

By OUR SPECIAL COMMISSIONER.

THE members of the British Association have been arriving in increasing numbers, the last to come being the detachment on the *Windsor Castle* which arrived on Monday, July 22nd, at daybreak. There has surely never been a B.A. meeting attended by so many bronzed and weather-beaten members, the voyage from home having been remarkably smooth, and the dreaded Bay of Biscay was almost as calm as the proverbial mill pond. The dining saloons have had few empty places on any of the steamers that have brought the great concourse of 540 people over 6,000 miles from home. The *Hestor* brought a representative gathering of astronomers, physicists, and engineers, and Sir Ernest Rutherford one evening occupied the unusual rôle of judge at a Mock Trial. In spite of our smooth passage, he pronounced heavy sentences on Professor Eddington and Sir Frank Dyson, for their attempts to modify our conceptions of time and space, on Dr. Vaughan Cornish for his continued efforts on the waves, and on Sir Gilbert Walker for his ineffective control of the weather. Sir Gilbert Walker's counsel showed some confusion of mind as to the difference between a monsoon and a mongoose.

It should be recorded that the Astronomer Royal, Sir Frank Dyson, showed himself no mean performer at bucket quoits, and that Dr. R. H. Fowler (Sir Ernest Rutherford's son-in-law) was a champion at deck tennis, winning what some members called the " assisted " men's singles. It is fitting that the President for the meeting, Sir Thomas Holland, should be a geologist, for the principal industries in South Africa are gold and diamond mining, and engineering, though important, is of secondary interest. Cape Town is mainly a commercial city, though attempts have been made to find tin on the slopes leading up to Table Mountain, and agriculture is flourishing, especially in the vine-growing districts at Croote Estancia, near Cape Town.

There is not much of great electrical interest in Cape Town itself. As in England, electrical development is controlled by an Electricity Control Board, under the direction of which the Electricity Supply Commission operates, all extensions to power stations having to be approved by them before they can be undertaken. The original supply to Cape Town was two-phase, but that is now being altered to three-phase with 380 volts between lines, and a domestic supply at 220 volts between line and neutral.

The new Salt River station, in which the last unit was installed last September, is of interest, especially in view of the arrangements made to use sea water for condensing. Two " spun " reinforced concrete pipes known as " Hume " pipes, each 6 ft. in diameter and 1,500 ft. long, have been laid in a concrete trench almost perpendicular to the foreshore, a passage being left between them which provides access to a tower erected in the sea about 1,200 ft. from the shore, which contains the controlling inlet valves. The seawater, after being pumped through the pipes, is first passed through two vertical screens, operated in much the same way as the grate of a chain grate stoker. These collect the free seaweed which is apt to accumulate near the entrance to the pipes, and this is washed off by a spray of water and is carried through a cross channel to the sea. There is not much trouble here with sand, as the sand-drift in Table Bay does not appear to be serious, the tide being only 3 or 4 ft. After passing through the condensers the outflow runs into a concrete lined channel, which is built over the top of the intake pipe. The water is pumped into the condensers by three centrifugal pumps driven by motors

with long vertical shafts, the driving motors being arranged on the main floor of the power house. This power house is spaciously laid out and contains three 11,000-kVA units, built by the English Electric Co., and driven by "Zoelly" turbines supplied by Messrs. Howden, of Glasgow. It is designed with a view to further expansion. At present it supplies the peak load of the Corporation electricity supply, and operates with a poor load factor. Coal is not cheap in Cape Town, the charge for freight by rail being over £1 a ton from the Natal coal mines. The distance to neighbouring townships being so large, and their loads so small, there is no case at present for an extended system of electricity supply, with an interlinking network.

Cape Town is a self-contained area which extends for 23 miles, from Sea Point on the Atlantic Ocean to Kalk Bay in the Indian Ocean. It is a strip which varies in width from half a mile to over 2 miles and lies at the foot of Table Mountain along its whole length. From the electrical standpoint, therefore, it is a difficult area to supply. The generators develop 11,000 volts at 50 cycles, which is transformed up to 33,000 volts for the main distribution lines. Electricity is not being used very extensively for domestic purposes, though the load is growing here as elsewhere. One feature of interest in connection with the 1,500 volt direct current railway electrification between Sea Point and Simonstown (which will soon be discontinued) is that the rotary convertors in the sub-stations are all started up and controlled by relays operated from the main Salt River station. In the outlying districts the house service is carried by overhead lines supported on iron poles, and the rate charged usually approximates for a full service to 1d. per unit for homes of average size. An interesting engineering enterprise which is nearing completion is the aerial ropeway to the top of Table Mountain. This is to be electrically driven, the cars being hung from a wire rope which is passed round a large driving drum. The lower station is nearly 1,000 ft. above sea level, and the total rope span is nearly 4,000 ft., with a vertical lift for the carriage of nearly 2,500 ft.

On Monday morning a formal welcome was given to the members of the Association by the Mayor of Cape Town. Sir Thomas Holland, in replying to the address of welcome, ended his speech with a sentence in "Africaans." This language approximates closely to Dutch, though a great many words are of local origin, many Malay and Kaffir words having crept into it. There is a substantial Malay colony in Cape Town which has been resident there from the time when the East India Company maintained gardens and farms in Cape Town for the purpose of provisioning their ships, and some of the best unskilled and skilled labour is obtained from them. Sir Ernest Rutherford also replied to the address of welcome and spoke of the catholicity of the Association and mentioned the fact that Sir Thomas Holland was a Canadian and that he himself was a New Zealander. One of the most remarkable personalities here is the President of the South African Association for the Advancement of Science, Mr. J. H. Hofmeyr. The address given by him to the South African Association in the afternoon was a masterly survey of the scientific problems that South Africa had to solve, and the work that Africa had done already in providing material for scientific investigation. At the close of the meeting, a medal, founded in commemoration of the visit of the British Association to South Africa in 1905 was awarded to Dr. R. Broom, F.R.S., for his investigation on the Permian fossils of the Karoo, of which he has found over 200 specimens.

The sectional meetings of the Association are being held at the new University Buildings at Groote Schur, on the estate purchased by Cecil Rhodes. Just below the University Buildings is the summer home where Cecil Rhodes came to think out his great Imperial schemes, and just above the University Buildings is the wonderful memorial to him with Watts's statue of Physical Energy in the foreground. This is the original statue that was modelled by Watts at Rhodes' request. It would be difficult to find a more magnificent position for a university, and the atmosphere is so clear that the Hottentot-Hollands Mountains, over 40 miles away, have been visible nearly every morning. The buildings have only recently been completed, and the new engineering laboratory is still in course of construction.

The first meetings of Section G dealt with some problems of refrigeration. One paper by Mr. Davis, the government biologist, dealing with the biological aspect of the question, and the other two by Mr. E. G. Griffiths and his brother, Mr. Ezer Griffiths, F.R.S., dealing with the engineering aspects. The main export from Cape Town is fruit, and the difficulty of transporting fruit across the tropics was the main theme for discussion. While it is comparatively easy to deal with citrus fruits such as oranges, the carriage of soft fruit has proved very difficult, mainly on account of the damage done by careless handling. The possibility of "gas" preservation in combination with refrigeration is being examined, and it would seem that this is the most likely solution. Another paper by Colonel J. G. Rose and Professor MacMillan, of the University of Cape Town, dealt with alcohol fuel mixtures for motor cars. The use of alcohol fuels is of great importance in South Africa, on account of the large areas on which vegetation, suitable for the production of alcohol fuel, can be grown. Large quantities of wine are emptied into the river near the wine farms which might provide much useful fuel. Professor MacMillan has carried out a large number of tests of alcohol mixtures, and has shown that under suitable conditions an alcohol mixture has better working thermal efficiency than petrol, and that if ether is mixed with the alcohol, starting under cold conditions can be as easy as with petrol.

In Section A Sir Ernest Rutherford read a paper on the origin of actinium, and described the recent work of Aston, mentioned in a letter to *Nature*, on the spectroscopic examination of the radio-active mineral "Bröggerite." He has shown that the isotope of lead obtained from this mineral of mass 207 is mainly due to actinium lead. This isotope is called actino-uranium. From the ratio between the number of atoms of actinium lead to those of uranium lead, the probable time that the uranium lead and the actinium lead have been disintegrating can be estimated. If the period be taken at 4.2×10^8 years, the amount of actino-uranium is about 0.28 per cent. of the main uranium isotope. From the amount of actinium actually present it is inferred that uranium was being produced in the sun 4×10^9 years ago and is probably being formed there to-day, and that the earth was probably projected from the sun about 3×10^9 years ago. If the formation of the earth had occurred earlier there should be no actinium present to-day.

In the afternoon a reception was held in the University Buildings, which was attended by nearly all the delegates, together with large numbers of the members from Cape Town. The visitors were received by Sir Carruthers and Lady Beattie, Sir Thomas Holland, and Dr. J. H. Hofmeyr, and the visitors were greatly impressed with the splendid provision made, both in the men's and women's hostels, for the reception of students; the rooms are fitted almost entirely with teak wood, and the dining halls and common rooms will bear comparison with the finest halls of the older colleges at Oxford and Cambridge. It is unfortunate that the exteriors of these buildings are not so impressive as they might have been. In the evening some members of the Association were invited to a meeting of the Owl Club, founded by Sir David Gill, and now presided over by his successor at the Cape Town Observatory, Mr. Spencer Jones. Others attended a discussion on science and industry; Mr. F. E. Smith gave an account of the way that science has aided navigation, first by the introduction of the compass, and later by the experiment on ship forms that has increased so much the speed and efficiency both of warships and merchant vessels. He also referred to the echo method that has been developed since the war for determining the depth of water by the time elapsing between the sending out of sound from a ship and its reception as an echo from the bottom of the sea.

Sir Daniel Hall dealt with the application of science to agriculture. A most interesting account was given on Tuesday morning of the work done at Rothamstead, and it is hoped that the visit of the Association may do

something to help forward the solution of the difficult problem of poison veldt. This was deal with in a paper by Sir John Russell.

On Wednesday, Section G devoted the whole morning to three papers by Mr. Lloyd Davies (the city engineer of Cape Town), Sir Henry Maybury and Sir Henry Fowler on Road Transport. The road problem is a very different one from that of older countries, the maximum gradient of some of the roads in the neighbourhood of Cape Town is 1 in 4, and in the country districts, the "dongas" or direct water courses are very difficult to negotiate. There was a general consensus of opinion that the construction of main roads parallel with the railways was an extravagance that South Africa could not afford, and that the best type of transport was one in which the loads were hauled by tractors along tracts that acted as feeders for the railways. One of the most difficult problems in South Africa is the heavy flooding of rivers that may occur during the rainy season. This is being dealt with by the construction of causeways, which can be used at all times, except when the floods are very heavy, and which are far less expensive to construct than bridges.

The International Relationship of Minerals.

By SIR THOMAS HOLLAND, K.C.S.I., K.C.I.E., LL.D., D.Sc., F.R.S., President of the Association.

(*Abstract.*)

Whoever it was who first discovered the possibility of raising grain-crops by sowing seed diverted the evolution of man along an entirely new branch, and so laid the foundation on which our civilisation was subsequently built.

Compared with this economic application of observational science, the later inventions—explosives, printing, the steam engine—were but minor incidents in the evolution of civilised activities. This discovery was not one of merely material advantage, for it necessarily led to the idea of storage, and so opened up a new mental outlook for primitive man. This new possession of field-crops created new anxieties, which contained the germ of future political problems.

Up to historically recent times national boundaries became extended, or were fought for, mainly because agricultural products were a necessity for the maintenance of communal life. When British traders first went to India they extended their influence first along the navigable rivers for the trade in vegetable products, which were raised on the alluvial lands around; and so British India is now mainly agricultural.

Whether, and to what extent, the possession and use of mineral resources may now modify that dominant spirit is the principal question to which I wish to invite your attention this evening. The recognition of agriculture as a leading inspiration for acquiring territory has been modified occasionally by "gold rushes" into lands previously unoccupied, but they have generally had a temporary, often a relatively small, importance. The whole of the gold produced in Australia since its discovery in 1851 is less in value than that of three years' output of Australian agriculture.

Even here in South Africa, which produces half the world's supply of gold, the value of the metal is still less than that of the pastoral and agricultural products. The total production of gold for the whole continent of South America last year was worth no more than a hundredth part of the surplus of agricultural products which the Argentine alone could spare for export.

It is obvious that the growth of the industrial revolution was due to the close association of suitable minerals in England. It was because non-phosphoric ores were still available that, at a later stage, Bessemer was able to give that new impetus which increased the lead of the English steel maker. In 1888 Sir Robert Hadfield produced his special manganese steel, which led to the production in commercial quantities of metals which were previously of interest mainly in the laboratory. The adoption of alloys, especially the ferro-alloys, at the end of the last century made it necessary to look further afield for supplies of those metals that had hitherto been regarded as rare in quantity and nominal in value.

The country in which the industrial revolution originated could no longer live on its own raw materials, and never again will do so. Even in peace time Great Britain alone consumes twice as much copper and just as much lead as the whole Empire produces.

The political boundaries of the nations, originally delimitated on considerations dominantly agricultural in origin, have now no natural relation to the distribution of their minerals. This circumstance gives a special meaning to measures recently designed on supplementary lines in Europe and America for the maintenance of international peace, measures which can succeed only if the facts of mineral distribution become recognised as a controlling feature in future international dealings. For the present the depletion of natural stores is not yet alarming, although the rate of acceleration, by reason of its local variation, forces into prominence some international problems, which will, if effectively tackled, facilitate the efforts to stabilise international relations.

The first feature of surprising interest is perhaps the relative abundance of metals such as copper, lead, tin, zinc, and nickel. Nickel, in spite of its price and limited use, is twice as abundant as copper, five times as abundant as zinc, ten times as abundant as lead, and from fifty to one hundred times as abundant as tin. Among the so-called rare metals, some are distinctly more abundant than lead, which is the cheapest, and is consumed at the rate of over a million tons a year.

One gets at once an indication of two important features. Firstly, the miner works only those deposits in which the metal is concentrated sufficiently to make their exploitation a profitable business; and secondly, the metalliferous ores vary greatly in the completeness with which they have been concentrated in special places to form workable ore-deposits. Nickel-ore, for instance, occurs under conditions which conspicuously hinder its freedom of local concentration; and we shall never recover for use in the arts any fraction of our total supplies of nickel as large as we shall of most of the others. Under the present state of mining and metallurgical practice, the deposits in the world worth working can be numbered on the fingers of one hand, and nine-tenths of our supplies come from a single district in Canada. We shall never recover more than about one-millionth of the total that lies within workable distance from the surface of our accessible dry land, and our greatest total tonnages are not contained in the rich deposits, but in those of low-grade.

Every advance in metallurgical science and in mining technology that makes it possible to work our low-grade ores adds appreciably to the economic value of civilisation; but when a miner raises a supply of ore in concentrated form for the metallurgist, he damages, and so places beyond reach for ever, far larger quantities of residual ore than he makes available for use. When a metallurgist takes over the product of the miner and separates the refined metal he also incurs serious losses. The gradual elimination of manual labour—the highest constituent of the total bill—by mechanisation is obviously the most profitable line of research. But mechanisation carries with it in general a tendency to limit operations to the larger deposits.

The British Empire and the United States produce over two-thirds of the 2,000 million tons of mineral that the world now consumes annually. Each of them has more than it wants of some minerals; but, in order to obtain its own requirements, each finds it necessary to sell its surplus to obtain supplies from other nations to keep its industries alive. It is not possible to make synthetic metals, and it never will be; it is not even possible to make artificial substitutes for many essential minerals that are used as such and not merely for their metallic constituents.

Thus, the international exchange of minerals is an inevitable consequence of our new civilisation. Primitive workers in various lands have opened up to relatively shallow depths rich, but small, deposits of other ores, but what satisfied the primitive metallurgist in abundance would be of little use to the modern furnace. We must now rule out the smaller deposits and review afresh the resources of the undeveloped Far East, which has for many years been regarded as a menace to Western industrial dominance. Thus, assuming that China may yet become a homogeneous national unit, there is very little doubt that the country is deficient in those minerals that form the essential basework of the modern form that civilisation has definitely taken. Anglo-Saxon character would have found limited scope for its energy, but for the fact that nine-tenths of the coal, two-thirds of the copper, and as much as 98 per cent. of the iron-ore consumed by the world come from the countries that border the North Atlantic.

The industrial revolution, which began in Great Britain, is now assuming a new character. It spread first to the western countries of Europe, because of the favourable conditions of mineral resources, but the force of the movement faded out towards the Slavic East and the Latin South; the mechanical industries of Italy are based on imported scrap. West of the Atlantic the natural conditions which originally favoured Great Britain were found to be reproduced on a larger scale. Political control, which follows industrial dominance, must lie with the countries that border the North Atlantic; the demand for the interchange of mineral products will be satisfied in spite of fiscal barriers.

The results of science and technology now limit the effects of national ambitions, and therefore dominate the international political atmosphere. The League of Nations has accomplished a large measure of international understanding in questions of social value. The more recent and simpler pact of Paris, associated with the name of Mr. F. B. Kellogg, wants equally an ultimate instrument for its practical enforcement. If the British Empire and the United States agree in refusing to export mineral products to those countries that infringe the Kellogg Pact, no war can last very long, as it is easier to stop exports than to prevent imports.

D

Science and Engineering.

By Professor F. C. Lea, D.Sc., President of Section G—Engineering.

It is not desired in this address to emphasise the intellectual or political influences of engineering, but rather to suggest: (1) the vital importance of scientific research to engineering, (2) that as in the remarkable engineering developments of the last century the scientific method has been the key to progress, even so it must be in the future, and (3) that there are many engineering problems of great interest and importance, not only to engineers, but to the general public, which can only be solved by supplementing experience by direct and indirect attack, using all the aids that mathematical and experimental science can give. It is also desired to suggest that all the arguments for a public interest in scientific research apply with particular force to the work of this section.

Engineering is much older than modern science. The engineer to-day has to guide him the accumulated experience of many thousands of years, and for a solution to many problems with which he is faced he has to fall back upon this accumulated experience and his intuitive ability. For this reason it is sometimes argued that engineering is an art, and that it owes little to science. The revival of experimental method, leading to the wonderful conquests of physics and chemistry, and in the new attempts to co-ordinate the results of experience into a body of theory, assisted by the new mathematics, gave to engineering that impetus and assistance necessary for the achievement of the last century.

"Meanwhile, let no man look for much progress in the sciences, especially in the practical part of them—unless natural philosophy be carried on and applied to particular sciences and particular sciences be carried back to natural philosophy," wrote Francis Bacon in 1620. Twenty-four years after Bacon wrote these words Galileo died, and in the same year Sir Isaac Newton was born. From their joint labours, carried out without any desire for practical usefulness, came the principles of mechanics, without which much of the progress of the last three centuries would have been impossible.

A little more than sixty years after Watt built his first steam engine, Michael Faraday discovered that a magnet could be made to spin round a fixed wire through which a current of electricity was flowing, and a wire containing a current could be made to spin round a fixed magnet. Without these and other equally fundamental experiments the wonderful developments of the generation and transmission of power which have taken place during the last fifty years, as well as the application of electricity to almost every need of the engineer, would have been impossible.

It is true that Carnot and Clausius came after Watt to perfect thermo-dynamic theory, and the modern theories of electricity were not known when Siemens made his first dynamos, but experimental and mathematical science had shown the way to engineering developments of the greatest significance to the life of the world. Water-wheels were used to raise water 2,000 and more years ago, but in the seventeenth century water-wheels were little different from those described by Vitruvius in the first century before Christ, and had efficiences well below 50 per cent. In the latter part of the eighteenth century, organised experiments on the flow of fluids had been carried out, relative velocities, momentum, and kinetic energy were well understood. The next step was made by Pancelet in 1832, who enunciated the guiding principles underlying the design of vanes receiving moving fluids, and from that time progress has been so remarkable that to-day water turbines of more than 70,000 h.p., having efficiencies greater than 80 per cent., are being constructed, and millions of horse-power are being generated by water-power. The brilliant achievements in the development of the steam turbine of Sir Charles Parsons and others following in his steps are to-day well-known. At the beginning of the nineteenth century there were probably 10,000 engines in England giving a total horse-power of about 200,000. To-day steam turbines, each capable of developing more than 200,000 h.p., have been or are being made for stations in various parts of the world. It seems very doubtful if this could have been possible except as a consequence of the work of Poncelet and two centuries of scientific experiment. The rapid developments of high-tension distributions of power have been made possible by research in the laboratory. Many attempts had been made to utilise the explosive force of gunpowder, hydrogen, and coal gas for power production before the modern four-cycle internal-combustion engine was developed, but without success, until it was recognised from thermo-dynamical considerations that compression is essential before ignition. The principles of geometrical and dynamical similarity based upon strict mathematical reasoning have been of the greatest service in the development of ships, aeroplanes, and airships. The work of Sorby on the micro-sections of rocks has led to micro-photography of metals, which has been of the greatest assistance to the metallurgist in the development and control of those metals which have played such a revolutionary part in modern engineering. Unfortunately, sufficient use is not made by engineers of this powerful aid to uniformity of product. Accurate pyrometry and uniform distributions of temperature in heating furnaces are essentials of success in many branches of engineering using alloys of steel and aluminium, cold-worked metals, and many other forms of materials.

The important steps that have been made in engineering during the last hundred years and that distinguish this century from all preceding ones, were made possible by fundamental discoveries of science, and it can safely be anticipated that no new epoch-making developments in the future will be possible unless they are preceded by new fundamental scientific discoveries. Sufficient energy can be transmitted across oceans by directed beams to allow of telephonic communication, but it seems improbable that wireless transmission will be possible for the large outputs of power-generating stations.

Rutherford has shattered the nucleus of the atom. Dr. Krapitza, in the Cavendish Laboratory at Cambridge, has claimed to have reached temperatures of 1,000,000° C., and Eddington tells us that in the great power houses of the sun and the stars, where the temperatures are, it is estimated, as high as 40,000,000° C., the energy of the escaping electrons of the atoms is the source which for millions of years has made, and will make, it possible for the sun and stars to radiate energy without appreciable fall in temperature.

It may be impossible for atomic energy in large quantities to be obtained and controlled. Also it may be equally impossible to obtain energy by the synthetic building up of other elements from the fundamental element, hydrogen; but it seems certain that only by following the new ways opened by pure science can there be hope of success. As many years ago there came the new and wonderful discovery of voltaic electricity, while Galvani was making experiments with frogs, so in the future a bioglogist or chemist or physicist, working on some subject entirely remote from the production of energy, may make discoveries which the Watts and Faradays of the future may use to change the life of the world.

From the point of view, then, of developments in engineering, modern communities cannot afford to neglect the encouragement of scientific research, even in those subjects which at present may seem most remote from its activities. Upon almost every section of this association engineering lays tribute, and in return engineering has given something at least to make possible much of the brilliant work associated with other sections. The precision of modern engineering made possible the manufacture and control of the great telescopes and other instruments, upon the accuracy of which the possibility of testing the attraction, predicted by Einstein, of the light rays of the stars by the sun depends.

In his essay on James Watt, Francis Arago wrote in 1834: "There are two things to be considered in every machine; on the one hand the moving power, and on the other the arrangement, more or less complicated, of the moving parts," and, he might have added—the difficulty of materials suited to the new purpose.

Many years of labour experimenting with materials were necessary before the steam engine was at all perfect, and in every step that has been taken in the direction of higher pressures and higher temperatures, new materials and new processes have been necessary before success could be achieved.

Much has been done in the development of prime movers, but there is perhaps no movement in engineering to-day that is of greater interest than the attempts that are being made considerably to increase the efficiency of power production from coal and other fuels. The average overall thermodynamic efficiency of the public stations distributing electrical energy in Great Britain for the year ending March, 1928, was about 15 per cent. The best station had an efficiency of 21.3 per cent. Recently a power unit has been supplied from England to Chicago which on test gave an efficiency of 34 per cent.—a remarkable figure. Making allowance for boiler losses, efficiencies of from 25 to 35 per cent. ought to be possible, therefore, in the future, and if only suitable materials can be developed to meet the onerous conditions of temperature, corrosion, and erosion, higher efficiencies than 35 per cent. may be anticipated with steam plant. Still higher thermodynamic efficiencies may be expected, as well as the chemical riches of the coals preserved, if, as a result of research, solid fuel engines or gas turbines can be developed. At the temperature of from 400° F. (205° C.) to 600° F. (315° C.), at which boilers and superheaters have until recently worked, mild steels have been found suitable. To realise higher efficiencies than at present, much higher temperatures will will be required, and at contemplated temperatures of 1,000° F. (538° C.) and upwards carbon steels creep at low stresses. Below a certain stress, at a particular temperature, which I have ventured to call "The Limiting Creep Stress," the creep ceases, or becomes so small, that it cannot be observed in a number of days. This limiting creep stress is evidently the important factor in the problem of high working temperatures. Experiments indicate that with alloy steels limiting creep stresses much higher than those obtained from carbon steels may be expected, and that alloys of iron, nickel, chromium, with or without other alloyed elements, containing as much as 60 per cent. of nickel and chromium, have considerable strength at high temperatures, and also resist corrosion and erosion. There is still, however, a very large amount of research to be done in which the laboratory and the workshop must co-operate, as new workshop technique is required before these alloys can be used for specific purposes. More rapid progress could be made and a much bolder policy pursued, if the public organisations and the large power distributing companies and authorities accepted the responsibility of the provision of funds for research. In the Universities much fundamental work can be done if funds are available. The Department of Scientific and Industrial Research is assisting industry and the National Physical Laboratory to carry out researches on the physical properties of metals at high temperatures.

Business and Industrial Notes.

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures.

A List of Radio Wholesalers.

We have received from the Radio Wholesalers' Federation a copy of a list of radio wholesalers, upon the compilation of which the Federation has been engaged since its inception The list comprises 181 wholesale radio depôts which, it is estimated, substantially cover the country and are capable of providing adequate wholesale service to the manufacturing trade generally. It is intended to afford a guide to manufacturers in selecting firms or companies which may be granted wholesale distributing terms upon radio goods. Establishments of members of the Federation are shown in bolder type, and head offices are indicated by an asterisk.

Boy Scouts in a Switchgear Factory.

The accompanying photograph shows a party of 98 Boy Scouts, comprising 49 Swedes, 33 Finns, 8 Barbadoes, 4 British, and 4 Portuguese, being conducted round the Buckley Street factories, Manchester, of Messrs. Ferguson, Pailin, Ltd., on the afternoon of August 12th. They were much interested in the various operations and processes entailed in the manufacture of modern electrical switchgear.

A Party of Boy Scouts from the Jamboree on a Visit to Ferguson, Pailin's Works.

Exemption from Key Industry Duty.

The Times reports that the Treasury has made an order under Section 10 (5) of the Finance Act, 1926, exempting mercury vapour rectifiers, neodymium oxide, praseodymium oxide, and yttrium oxide from the Key Industry Duty from August 20th, 1929, to December 31st, 1930.

Edison Swan-B.T.-H. Marketing Arrangements.

An important development in electrical merchandising in this country was announced last week. On August 12th, as the result of arrangements made between the Edison Swan Electric Co., Ltd., and the British Thomson-Houston Co., Ltd., the wiring supplies, lighting engineering, electric refrigeration and radio business of the British Thomson-Houston Co.. Ltd., was taken over by Edison Swan Co., Ltd., who will market the British Thomson-Houston Co.'s products in these lines. The above business with that of the Edison Swan Electric Co., Ltd., will be carried on for the time being at 123-125, Queen Victoria Street, E.C.4, and various other addresses in the provinces which are set forth in a circular. Mazda radio valves will also be marketed by the Edison Swan Co., Ltd., for the B.T.-H. Co. Mazda lamps will not be included under this arrangement, but will continue to be marketed by the Lamp Sales Department of the British Thomson-Houston Co., Ltd.

New Municipal Showrooms.

The Oldham Corporation's new electricity showrooms in Union Street, Oldham, were recently formally inaugurated. The premises have two large display windows, one on each side of the entrance, in which there are attractive displays of domestic appliances. On the well arranged ground floor showroom small appliances are shown in neat glass display cabinets, and there is also a demonstration and lecture room. The first floor is divided into four rooms, which are furnished to repesent a bedroom, bathroom, sitting room and lounge, each incorporating suggestions for the use of electricity in the home. On the top floor is a further selection of electrical appliances, and in the basement is an exhibition of electric cookers, wash boilers and washing machines, all connected up for demonstration purposes. Mr. R. Worcester, the electricity department's architect, was responsible for the design of the building, whilst the whole of the electrical fittings and appliances were installed by the department's staff under the supervision of Mr. F. L. Ogden, the Borough Electrical Engineer. After the opening ceremony the party adjourned to the Town Hall for tea. In the course of a speech, the Mayor said the chief difficulty which had militated against the development of the use of electricity was the high cost and maintainance of the apparatus, and he expressed the hope that the various schemes of the Electricity Committee for the assistance of the consumer would be supported.

The International Fair at Prague.

The *Financial Times* reports that the autumn session of the Prague International Fair will be held from September 1st to 8th. About 3,000 firms have already retained space, and more are following. Many foreign exhibitors will also take part, among whom will be an official French section, a collective exhibition by the Soviet Republics prepared on a large scale, and a Spanish section. The Sample Fairs are held not only in the main exhibition grounds, but also in the New Fair Palace, said to be the biggest business building in Central Europe.

Swiss Market for Heating Appliances.

The *British Chamber of Commerce Journal* reports that since 1913 there has been a marked increase in the use of various electric heating appliances in Switzerland, which is favoured by a highly-developed electrical industry. Sales of electric cookers have been particularly heavy during the last few years, but more business would have been done but for electricity being at present more expensive for cooking than gas in some sections, particularly Berne. In districts where cheaper electricity is available electric cookers are usually installed. The demand for heaters is not so great, although they are used to a fairly large extent. It is only possible to sell imported electric heaters if they are distinctly competitive in price. There is a wide use of electric kettles, and teapots and coffee percolators are in demand, but toasters are not used in Switzerland quite so much as in Great Britain. In recent years there has been a notable development in trade in the electric iron, which is now the most widely used electric household appliance in Switzerland. It was estimated that 556,000 irons were in use in 1927 in the country, the increase during that year being about 42,000.

Advertising Electricity at Otley (Yorks.).

Work on the public electric lighting scheme, which is being carried out for the Otley Urban District Council by the Electrical Distribution of Yorkshire, Ltd., is making good

Electrical Installations on Easy Terms.

progress, and an assisted wiring scheme has been introduced for the benefit of householders in streets where the mains are being laid. The accompanying illustration shows a poster drawing attention to the scheme, which has apparently aroused considerable local interest.

Bankruptcy Proceedings.

John Lawrence Whiting, 4, Portland Street, Newark, electrical engineer and contractor.—The first meeting of the creditors was held on August 14th at the Official Receiver's offices, 22, Regent Street, Park Row, Nottingham. According to the statement of affairs, there were liabilities amounting to £492, against assets of £14, leaving a deficiency of £478. Debtor stated that he commenced business in 1924 at Newark without capital. In 1927 he was appointed agent for the sale of electric lamps, and he received stock to the value of £50. Just after he received the lamps an execution was levied on his business premises, and the lamps were sold by the sheriff. Debtor was called upon to replace the stock, and he had to pay £20 to settle the matter. From a trading account prepared for 1926 it appeared that the debtor had made a net profit of £4 12s. on a turnover of £600. He attributed his failure to want of capital and doing work at too low a price. The case was left in the hands of the Official Receiver.

A. K. E. Strathdee (trading as Emsco Radio), electrical engineer, 923, Romford Road, Manor Park, London, E.—This debtor's public examination was held in the London Bankruptcy Court on Tuesday, before Mr. Registrar Mellor. The liabilities, according to his statement of affairs, are £764, of which £614 is expected to rank, and the assets £310. It appeared that in November, 1918, with a free capital of £200, the debtor took premises in Leytonstone Road, N.E., and began business under the style of Electrical and Mechanical Supplies Co. In November, 1922, he began dealing in wireless apparatus and changed his trading name to Emsco Radio. In June, 1928, his wife took a lock-up shop at 923, Manor Road, on a 3 years' agreement. He, however, paid the rent direct to the landlord and removed his stock to that address where he continued to trade until the date of the receiving order. The debtor attributed his insolvency to ill-health, bad debts, and depreciation of stock because of removals and storing. The examination was concluded.

H. W. Davies and R. A. Davies, trading as Davies Brothers, 34, Mill Street, Crewe, Cheshire, cycle and wireless dealers.—The first meeting of the creditors was held on August 12th at the Official Receiver's office, 12, Lonsdale Street, Stoke-upon-Trent. According to the statement of affairs presented, there were liabilities amounting to £574 against assets of £92. From that amount had to be deducted preferential claims of £48, leaving a deficiency of £528. Debtors attributed their failure to losses by fire in the business which they carried on at Northwich until November, 1928; heavy overhead charges; and falling-off in trade through unemployment at both Crewe and Northwich. They received £500 insurance, but their losses were £800. This they were unable to prove owing to the destruction of their books. The matter was left in the hands of the Official Receiver.

D. B. John, trading as D. B. John & Brothers, 8, Commercial Place, Pentycymmer, and the Nanthir Stores, Nanthir Road, Blaengarw, both Glamorganshire, electrical engineer, ironmonger, &c.—The adjourned public examination of this debtor was held recently at the County Court, Wyndham Street, Bridgend. A statement of affairs had been produced which showed liabilities of £1,099, and there was a deficiency of £1,005. The examination was closed provisionally upon the production of certain documents.

W. H. Thornton, electrical and wireless engineer, 25, Bridge Street, Burnley.—Receiving order made August 13th on a creditor's petition.

O. B. Turner, salesman of electrical goods, Paddock House, Yeadon.—Receiving order made August 12th on debtor's own petition.

E. C. Wright (Amos & Wright) (separate estate), electrical and motor engineer, 21, Church Road, East Walton, Liverpool.—First and final dividend of 1s. 6d. in the £, payable September 2nd at the office of Mr. C. Turner, 155, Norfolk Street, Sheffield.

R. Hilton, electrical engineer, Kenmore, Ainsworth Road, and 81, Blackburn Street, Radcliffe.—Application for discharge to be heard on September 11th at the Court House, Mawdsley Street, Bolton.

B. Marsh, electrician, 6, Victoria Road, Brighton.—Trustee, Mr. A. E. Orbell, 6 & 7, Old Steine, Brighton, appointed August 9th.

C. B. Marsden, electrical engineer, 60, Pisgah Street, Kenfig Hill, Glamorgan.—First and final dividend of 5s. 10d. in the £, payable at the Official Receiver's office, 34, Park Place, Cardiff.

J. E. Dawson, wireless engineer, High Street, Boston. First and final dividend of 4s. 0½d. in the £, payable August 26th at 5, Church Close, Boston.

Company Liquidations.

British Marconi Co., Ltd.—Winding up voluntarily. Liquidator, Mr. T. J. Robertson, 19, South John Street, Liverpool.

New Standard Wireless Valve Co., Ltd.—A meeting of members is called for September 13th, at 27, New Hall Street, Macclesfield, to hear an account of the winding up from the liquidator, Mr. J. H. Janes.

Wireless Lights Syndicate, Ltd.—A meeting of members is called for September 12th, at the liquidator's offices, 41, Bedford Square, W.C., to hear an account of the winding up from the liquidator, Mr. W. Elles-Hill.

Newcastle Electrical and Motor Accessories, Ltd.—Winding up voluntarily. Liquidator, Mr. J. Nixon, Gibb Chambers, Westgate Road, Newcastle-upon-Tyne.

Dissolution of Partnership.

Vector Electrical Co., electrical engineers, 40, Broadfield Road, Sheffield.—Messrs. E. E. & A. Walker & J. Westby have dissolved partnership. Mr. E. E. Walker will attend to debts and continue the business.

Private Arrangements.

R. Wright & Co., electrical engineers, 2, Middleton Road, Cheetham Hill, Manchester.—The creditors were called together recently, when the representative of Messrs. Baxendale & Co., Ltd., was elected to the chair. The statement of affairs showed ranking liabilities of £1,039, of which £912 was due to the trade and £127 to the bank. The assets consisted of stock at cost £138, estimated to realise £69; work in progress £70; fixtures, fittings and goodwill £131, expected to produce £20; book debts £569, valued at £410; and motor-car £20; making a total of £589. After allowing £28 for preferential claims, the net assets were £561, leaving a deficiency of £478. It was reported that the business was commenced in 1921 by R. J. Wright, who traded on his own account until 1924. He was then joined by a partner who brought in £100, but subsequently a dissolution took place. In 1926 the debtor was joined by another partner, who also introduced £100 capital. The business appeared to have been successful until the end of last year, there then being a surplus of £37. The deficiency was accounted for by the depreciation written off the assets in the statement of affairs, and a loss on trading during the present year, together with costs of writs amounting to £119. About four months ago the debtor Wright, who was the active partner in the business, sustained a

serious motor accident, and was away for some time. The other partner had never taken any active part in the business. The debtor Wright had drawn £4 10s. a week, but his partner had never received anything. An offer was submitted of a composition of 10s. in the £, and the creditors decided to accept 12s. 6d. in the £, and failing the offer being increased to that amount the matter to be referred to the three principal creditors. The following are creditors:—

	£		£
Anderson & Green ...	96	Electric Lamp Factors, Ltd.	20
Abbey Cables, Ltd. ...	27	General Electric Co., Ltd.	164
Baxendale & Co., Ltd.	150	S. Greatrix, Junr. ...	36
British Thomson-Houston Co., Ltd.	59	Holt Electric Supplies Co., Ltd.	24
British Driver Harris Co., Ltd.	21	Houghton-Butcher, Ltd.	21
A. Dale & Co.	78	Nutter, Son & Edge, Ltd.	22
Electric Compounds, Ltd.	36	Philips Lamps, Ltd. ...	37

Trade Announcements.

CRYSELCO, LTD., has opened new branches at 172, Bath Street, Glasgow (telephone: Douglas 557; telegrams: Cryselco, Glasgow), and at 22, Sir Thomas Street, Liverpool (telephone: Bank 5310 and 5311; telegrams: Cryselco, Liverpool), where it will stock Cryselco lamps and all makes of Association valves.

The ELECTRO-MECHANICAL BRAKE CO., LTD., announces that consequent upon Messrs. Green & Jackson, of 12, Cherry Street, Birmingham, having dissolved partnership, the agency for the sale of its electrical products in the Midlands district is now held by Messrs. P. H. Jackson & Co., 174, Corporation Street, Birmingham.

EDISON ACCUMULATORS, LTD., 15, Upper George Street, Edgware Road, W.1, states that it has equipped a large factory at Redditch for the manufacture of its improved Edison nickel-steel accumulators. Mr. R. A. Bachmann, who was for 18 years vice-president and general manager of the Edison Storage Battery Co., Orange, N.J., has joined the company.

The MACINTOSH CABLE CO., LTD., has appointed Mr. Q. O. Sansbury as its representative in the south-western and South Wales districts, with headquarters at Bristol. Mr. Sansbury is taking the place of Mr. A. C. Wiley, who has recently resigned from the company.

The registered office of the WESSEX ELECTRICITY CO. has been changed from 14, Waterloo Place, S.W.1, to Broad Sanctuary Chambers, 11, Tothill Street, S.W.1.

A new trade counter has been opened by SUPERLAMP, LTD., at 805, High Road, Leyton, E.10, for electrical and wireless apparatus.

SUPER-ELECTRIC HEATERS (1929), LTD., has removed from Imperial Works, Lever Street, Wolverhampton, to larger premises at Albion Works, West Bromwich.

Messrs. A. C. SCOTT & CO., LTD., have removed from 99, St. James' Street, Manchester, to 39, City Road, Manchester.

Messrs. CHESTERTON, JONES & CO., LTD., have removed their works from Walsall to Birmingham. Their new address is "David Works," Rushey Lane, Tyseley, Birmingham. (Telephone: Acocks Green 381 & 382).

New Catalogues and Lists.

Messrs. WILLIAM GEIPEL, LTD., Vulcan Works, 156-170, Bermondsey Street, S.E.1.—A pamphlet, illustrated in colour, issued by the Ward Leonard Electric Co., of Mount Vernon, New York, dealing with electric controlling equipment. Messrs. Geipel are the sole selling agents for the American company in the United Kingdom.

STANDARD WET BATTERY CO., 184/188, Shaftesbury Avenue, W.C.2.—An illustrated booklet describing the new cartridge type h.t. batteries for radio receiving sets.

Messrs. HEYES & CO., LTD., Water-Heyes Electrical Works, Wigan.—A well-produced catalogue dealing with "Wigan" lighting fittings. Illustrated and priced.

RADIOVISOR PARENT, LTD., 26, Coventry Street, W.1.—A folder describing the Radiovisor light sensitive bridge as applied to automatic lighting for street lamps, electric signs, factories, &c. Illustrated.

Messrs. S. G. LEACH & CO., LTD., 26-30, Artillery Lane, E.1.—Publication No. N.S.104, drawing attention to "Ebolite" standards and wall brackets.

ENGLISH ELECTRIC CO., LTD., Queen's House, Kingsway, W.C.2.—Publication No. K.31, illustrating and describing oil-immersed stator-rotor starters for slip-ring motors.

NOX ELECTRIC LAMP CO., LTD., Clarence Road Works, Hunslet, Leeds.—A blotter notifying customers of additions to plant and buildings for the manufacture of the company's lamps.

CAMBRIDGE INSTRUMENT CO., LTD., 45, Grosvenor Place, S.W.1.—A card advertising a complete lamp and scale outfit.

Messrs. DAVEY, PAXMAN & CO., LTD., Aldwych House, Aldwych, W.C.2.—A brochure giving particulars of Paxman steam boilers and superheaters. A number of line drawings and excellent illustrations of actual installations are included.

Messrs. HOPKINSON, LTD., Huddersfield.—List No. 2,130, giving particulars of the new "Hopkinson-Ferranti" patent steam stop valve.

GENT & CO., LTD., Faraday Works, Leicester.—A small folder drawing attention to some of the company's products.

Recent Contracts.

B.E.N. PATENTS, LTD., has been awarded an important contract by the Metropolitan Asylums Board for the installation at its western ambulance station, Fulham, of a high pressure car washing plant, air compressor equipment and ambulance disinfecting unit. The car washer consists of one of the B.E.N. Myers duplex high pressure pumps, motor driven, serving three wash points. The air compressor is a 16 C.F.M. pump, electrically driven and controlled automatically by an electric-pressure switch and contactor starter, coupled to a 60 gallon air receiver. For disinfecting, the company is supplying a specially designed pressure container from which the liquid is fed by air pressure to the special atomising guns, which deliver either a fine mist, or jet, as desired. Reducing valves control the pressure in the main air line on the guns and also on the pressure container, whilst provision has also been made in this line for tire inflation points, to which will be attached B.E.N. key gauges. The disinfecting unit is believed to be the first of its kind to be installed in the country.

Blackpool Corporation is purchasing one "B" type electromagnetic steel testing device from the Equipment & Engineering Co., Ltd.

For Sale.

Greenock Corporation invites tenders for the purchase and removal of traction battery with booster control switchgear, &c., two negative rail return boosters, one 450-kW rotary convertor, and 9-in. centrifugal pump motor. Edinburgh Corporation invites offers for one 5,000-kW turbo-alternator, one tandem-driven d.c. 1,200-kW turbine set, two sets of 6 d.c. motor-driven fans, and a quantity of steam and water valves. Kingston-upon-Thames Corporation has for disposal two motor-generator sets, 1,500-h.p. each, complete with switchgear. (See our advertisement pages to-day.)

Electrolytic Zinc Plant Extension.

The Electrolytic Zinc Company, of Australasia, has decided to extend its plant at Risdon, in order to provide an additional 30 per cent. capacity. This would make the company's annual output about 65,000 tons of zinc—a rate which would become effective within eighteen months. In this decision the directors have been influenced by a desire to meet the position which will arise in two years, when the company will be required to purchase in the open market concentrates additional to those derived from its own mines at a price in excess of that paid in existing contracts. The expenditure programme would not necessitate raising additional capital.

Receiver Appointed.

Mr. P. Leask, 27-28, Finsbury Square, E.C., has been appointed receiver of the Enterprise Manufacturing Co., Ltd., 83-85, Merton Road, Wimbledon, S.W.

German Exports of Wireless Apparatus.

Corresponding with the large augmentation in the production of apparatus for wireless telegraphy and telephony in Germany, which is calculated at 100 per cent. in 1928 over the previous year, the exports have also experienced a large expansion. In value the exports in the first half of 1929 amounted in round figures to 29,000,000 marks, or 7.4 million marks greater than in the equivalent period of 1928 and 10.9 million marks more than in the same period in 1927. It has this year been possible to open up new markets for the sale of wireless appliances. The most important markets now include Great Britain, Holland, Italy, Argentina, Denmark, and Australia. On the other hand, the imports of wireless apparatus into Germany also show a rising tendency. Expressed in value, the imports in the first half of this year totalled 5,900,000 marks, as against 3.1 million marks in the first half of 1928 and 1.5 million marks in that of 1927. The chief supplier to Germany is Holland, next the United States, and then Great Britain.

Demonstrating G.E.C. Electrical Units.

On behalf of the General Electric Co., Ltd., the United Service Transport Co., Ltd., of Clapham Road, S.W.9, is at present driving round the country a Morris Commercial van specially fitted up as a travelling showroom to demonstrate "Magnet" electric cookers. The electrical units which are on view are so arranged that they may be operated. The interior of the body is wired throughout to enable the stoves to be shown in operation, and four plugs into which inspection lamps may be fitted for scrutinising the equipment are also fitted at appropriate points.

Non-Syndicate Glow Lamp Production.

The N.V. Splendor Gloeilampen Fabrieken, which was originally established at Nijmegen in 1916, has acquired a site and buildings at Oss, where the production of lamps will be undertaken apart from the continued manufacture of lamps at Nijmegen. At present the company is stated to have an output of 170,000 per week, while the demand is such that the production is unable to keep pace with it. The rapid growth of the business is said to be due to the fact that the company is not a participant in the European Glow Lamp Cartel, but is the only independent undertaking in Holland which is not bound by fixed prices and a stipulated sales contingent.

New Indian Company.

The Nadiad Electric Supply Co. is the name of a new concern which has recently been formed at Ahmedabad, Bombay, with a capital of 400,000 rupees.

Social Event.

The Clesco Sports and Social Club of the County of London Electric Supply Co., Ltd., is holding its 13th annual horticultural exhibition and garden party at the company's sports ground, Grand Drive, Raynes Park, S.W., on August 31st. In addition to the distribution of prizes the programme will include a number of events arranged by the sports section of the club, a concert by "The Irresponsibles," and open-air dancing. A programme of music will be given by Callender's Cable Works "Premier" Band.

Merchandise Marks Inquiry.

The Standing Committee appointed by the Board of Trade under the Merchandise Marks Act, 1926, will hold an inquiry on September 30th and October 1st, as to whether imported wireless receiving sets, components, and accessories should bear an indication of origin. The inquiry will be held at the Board of Trade Offices, Great George Street, London, S.W.1. Communications should be sent to the secretary, Mr. E. W. Reardon, at that address.

Irish Free State Electrical Imports.

The imports of electrical goods, excluding machinery, into the Irish Free State during June last amounted to £49,626, bringing up the total for the first six months of the year to £311,717, as compared with £213,673 in the corresponding period of 1928.

Visit to Accumulator Works.

The Hart Accumulator Co., Ltd., recently welcomed a party of boys from the Leyton County High School, who were afforded facilities for inspecting the many processes of manufacture of "Hart" batteries, in which they evinced an intelligent and close interest.

Dubilier Patents.

A *Reuter* message from Wilmington, Delaware, states that the Radio Corporation of America has lost a suit brought against it in the Circuit Court, Wilmington, by the Dubilier Radio Corporation for the alleged infringements of patents.

Russian Orders for Sweden.

Prof. Henry Graftio, chief engineer for the hydro-electric works on the Svir, is reported to be in Stockholm in connection with the placing of orders for four large turbines of the value of approximately 6,000,000 kr. The order is intended to be placed with the Kristinehamn Mek. Verkstad and the Trollehattan Mek. Verkstad, provided that the conditions of credit can be properly arranged, as the situation in Russia, the professor states, is much better than formerly.

New French Companies.

Among the new electricity supply concerns recently formed in France are the Société de Distribution Electrique de la Grosne et du Centre, formed at Chalon-sur-Saone, with a capital of 5,400,000 fr., and the Société des Secteurs Electrique du Nord et du Pas-de Calais, Douai, capital 2,000,000 fr.

New Belgian Company.

Under the auspices of the Société Industrielle et Commerciale Electro-Mécanique and the Société Belge d'Appareillage Electrique et Industrie, a new company has just been formed in Brussels with a capital of 5 million fr. and the title La Société Belge de Porcelaine to manufacture porcelain parts for the electrical industry.

New Italian Company.

A new company has recently been formed in Milan with the title of La Società Imprese Elettriche Italo-Turche Marelli to establish electric power stations in Turkey and Asia Minor.

Italian Lamp Production.

The output of electric lamps in Italy during February last amounted to 1,802,615, bringing up the total for the first two months of 1929 to 3,630,424 lamps, as compared with 2,839,785 in the corresponding period of last year.

The B.E.A.M.A. Annual Dinner.

The annual dinner of the British Electrical and Allied Manufacturers' Association (Inc.) will take place at the Connaught Rooms on November 20th. Lord Derby, the President of the Association, will be in the chair.

Prices of Materials.

The following prices are only general, and they may vary according to quantities and other circumstances:—

	CHEMICALS, &c.	Price August 20th.	Fortnight's inc or dec.
a	Acid, Oxalic ... ... per lb.	5½d.	...
a	Ammoniac, Sal ... ... per ton	£60	...
a	Ammonia, Muriate (large crystal) ,,	£52	...
a	Bisulphide of Carbon ... ... ,,	...	...
a	Borax ... ... ,,	£25	...
a	Copper Sulphate ... ... ,,	£25 10s.	...
a	Potash, Chlorate ... ... per lb.	3½d. to 4d.	...
a	,, Perchlorate ... ... ,,	5½d.	...
a	Shellac ... ... per cwt.	£18 10s.	...
a	Sulphur, Commercial ... ... ,,	£11	...
a	,, Roll ... ... ,,	£11	...
a	Soda, Chlorate ... ... per lb.	3d.	...
a	,, Crystals ... ... per ton	£5 to £5 5s.	...
a	Sodium Bichromate, casks ... per lb.	3¾d.	...
	METALS, &c.		
b	Aluminium, Ingots ... ... per ton	£95 to £100	...
b	,, Wire ... ... per lb.	1/1 to 1/9	...
b	,, Sheet ... ... ,,	1/1 to 2/9	...
p	Babbitts Metal and Anti-friction Metals—		
	Grade I ... ... per ton net	£192	£4 dec.
	Grade II... ... ... ,, ,,	£135	£3 dec.
	Grade III ... ... ,, ,,	£71	£4 dec.
c	Brass (rolled metal 2" to 12" basis) per lb.	10¼d.	...
c	,, Tubes (solid drawn) ... ,,	1/0½ to 1/1	...
c	,, Wire, basis ... ... ,,	11¾d.	...
c	Copper Tubes (solid drawn) ... ,,	1/3	...
c	,, Bars (best selected) ... per ton	£110	...
c	,, Sheet ... ... ,,	£110	...
c	,, Rod ... ... ,,	£110	...
d	,, (Electrolytic) Bars ... ,,	£84 15s.	...
d	,, ,, Sheets ... ,,	£148 10s.	...
d	,, ,, Wire Rods ... ,,	£94 10s.	...
d	,, ,, H.C. Wire per lb.	11 17/32d.	...
f	Ebonite Rod... ... ... ,,	2/3 to 2/6	...
f	,, Sheet ... ... ,,	2/3 to 2/6	...
n	German Silver Wire ... ... ,,	2/2	...
h	Gutta-percha, fine ... ... ,,	nom.	...
h	India-rubber, Para fine ... ... ,,	11d.	...
l	Iron, Pig (Cleveland No. 3.) ... per ton	72/6	...
l	,, Wire, galv. No. 8. P.O. qual. ,,	£21	...
g	Lead, English pig ... ... ,,	£24 5s.	10/- dec.
g	Mercury ... ... per bot.	£22 2s 6d. to £22 5s.	...
e	Mica (in original cases) small ... per lb.	3d. to 8/-	...
e	,, ,, medium ,,	4/- to 8/-	...
e	,, ,, large ... ,,	10/- to 20/- & up	...
p	Phosphor Bronze, plane castings ,,	1/3½	...
p	,, ,, drawn bars & rods ,,	1/5	...
p	,, ,, rolled strip & sheet ,,	1/9¾	...
p	,, ,, wire... ... ... ,,	1/6¾	...
o	Platinum ... ... per oz.	£13 17s. 6d.	...
d	Silicium Bronze Wire ... ... per lb.	1/2½	...
r	Steel, Magnet, in bars ... ... ,,	7½d.	...
n	Tin, Block (English) ... ... per ton	£210 10s. to £211	£3 dec.
n	,, Wire, Nos. 1 to 16 ... ... per lb.	3/8	...

*For 1 cwt. lots. Special quotations against definite specifications.

Quotations supplied by

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co., Ltd.
p C. Clifford & Son, Ltd.
r W. F. Dennis & Co.

Messrs. James Forster & Co., reporting on August 17th, stated that the lead market was subjected to holiday influences last week, the business done being of a very limited nature. Prices opened firmer, but subsequently a reaction took place on freer offerings of August lead, which resulted in a contango being established. Conditions are exceedingly quiet both here and on the Continent, and seem likely to remain so for the rest of the month. Consumption, however, is well maintained as far as this country is concerned, and, given a sustained demand from the Continent, there does not seem much chance of prices declining to any extent. The Board of Trade returns for July, 1929, show imports of 22,943 tons and exports of 2,876 tons, leaving 20,067 tons for home consumption.

Lighting and Power Notes.

Accrington.—Year's Working.—The accounts of the Corporation Electricity Department (engineer, Mr. A. W. Clegg) for the year ended March 31st last record a total revenue of £82,842, as compared with £84,626 for the previous year. Working expenses totalled £41,034, as against £41,312, leaving a gross profit of £41,808 (£43,314), to which the dividend on invested sinking fund was added, making a total of £41,868 available. Capital and other charges absorbed £32,185, leaving a net surplus of £9,623, as against £9,651 in the preceding year. The sales of electricity for all purposes showed a decrease from 17,803,433 to 17,687,398 kWh, due to a falling off in the amount of energy sold for power and heating purposes. The average price obtained per kWh fell from 1.135d. to 1.119d.

Armenia.—ELECTRICAL DEVELOPMENTS.—The Government has appropriated 10,000,000 roubles (£1,000,000) for the construction of power stations this year. The construction of the Kanakir hydro-electric power station and a number of other power plants will begin shortly. The hydro-electric station, Dzorges (on the Dzorg river), from which electricity is to be supplied to the new fertiliser works, is to be put in operation next October.—*Reuter's Trade Service* (Moscow).

Australia.—SYDNEY.—*Year's Working.*—We have received from Mr. H. R. Forbes Mackay, general manager of the municipal electricity undertaking, a copy of his report, together with a statement of accounts, for the year ended December 31st last. The total revenue amounted to £2,249,796, as compared with £2,135,780 in the preceding year. The working expenditure totalled £1,376,620, as against £1,359,058, leaving a gross profit of £873,176 (£776,722). Interest on loans and contributions to sinking fund absorbed the whole of the gross profit, and there was a net deficiency of £33,737, to which was added a debit balance of £60,474 from the preceding year, making an accumulated deficit of £94,212. The capital expenditure during the year amounted to £2,473,459, and included £527,933 for land and buildings and £981,261 for machinery and equipment at the Bunnerong station, £233,625 for sub-station machinery and equipment, and £435,612 for underground mains. The total spent on the undertaking now stands at £13,386,230. The electrical energy generated amounted to 223,097,700 kWh and the quantity purchased from the Government Railways and Tramways Department was 140,717,100 kWh, making a total of 363,814,800 kWh, compared with 335,636,292 kWh in 1927. The sales increased from 277,744,342 to 300,984,176 kWh, and the maximum supply demanded from 93,000 to 124,425 kW. The total connections rose from 368,352 to 432,827 kW, and the average price obtained per kWh fell from 1.761d. to 1.720d. During the year 65 miles of overhead and underground l.p. mains were put into service. There was an increase in the mileage of streets lighted of 31, making a total length of 1,222 miles. Steady progress was made with the construction of the new Bunnerong power station. In addition to the building operations, extensive works were done in connection with the water supply, drainage and sewerage systems for the main buildings and lighting and power installations. It is expected that the whole of the work on the first section will be completed during 1929.

MELBOURNE.—The *Melbourne Argus* says that the State Cabinet has given directions for the preparation of a Bill to enable the State Electricity Commission to assume control of the electric supply undertaking and the electric tramway system in Geelong. The franchise of the Melbourne Electric Supply Co. to operate both undertakings will expire next year, and they will be administered afterwards by the Electricity Commission. Surplus power is supplied in bulk by the company at Geelong to the Commission and carried over h.p. transmission lines to several important Western district centres. At present the Western district system is the only independent part of the Commission's undertaking. It is proposed eventually to link it with the main State supply system by the construction of a transmission line from Melbourne to Geelong.

Barnsley.—MAINS EXTENSIONS.—The Corporation Electricity Committee has decided to extend mains to the Willow Bank district.

Bexhill.—YEAR'S WORKING.—The accounts of the Corporation electricity undertaking (engineer: Mr. Charles A. Frost) for the year ended March 31st last show a total revenue of £39,475 and a working expenditure of £27,149, leaving a gross profit of £12,327. The figures for the preceding year were: Income, £35,029; working expenses, £24,959; gross profit, £10,069. To the gross profit was added income from other sources, making a total of £12,538 available. After providing for capital and other charges there was a net surplus of £3,028, as compared with £252 in the year 1927-28. The electrical energy sold increased from 2,685,108 to 3,716,045 kWh, and the maximum supply demanded from 1,917 to 2,652 kW. The average price obtained per kWh fell from 2.92d. to 2.38d.

Blackburn.—ADMINISTRATION INQUIRY.—The investigation into the administration and organisation of the Corporation electricity undertaking is nearing completion. The special committee appointed by the Town Council to deal with the matter has prepared its report, which will come before the Electricity Committee and later will be brought before the full Council. There is no official statement as to the text of the report.

Brandon.—APPLICATIONS REFUSED.—The Rural District Council has been informed by the Electricity Commissioners that the applications of the Ipswich and Norwich Corporations for powers to supply electricity in the Council's area have not been granted, and that the supply will be in the hands of the East Anglian Electric Supply Co., Ltd.

Canada. — HYDRO-ELECTRIC DEVELOPMENTS.—Construction of the Beauharnois power canal is to be commenced almost immediately. The Beauharnois Light, Heat, & Power Co. has executed the final agreement with the Dominion Government, undertaking the condition imposed for the protection of navigation, and has filed detailed plans. Preliminary work, including the erection of camp buildings and the running of railway lines along the property for which machinery has been ordered, will commence as soon as possible so that everything may be in readiness for the starting of heavy dredging and excavation next April. It is expected that power will be delivered by the autumn of 1932.

The International Paper Co.'s first newsprint mill in New Brunswick now under construction in Dalhousie is to be electrically operated throughout. Most of the power required will be supplied from the company's Grand Falls hydro-electric station on the Saint John River, 110 miles distant, which has an initial installation of three 17,500-kVA 6,600-V generators. In the Dalhousie boiler house two turbo-generator units will be installed to operate in parallel with the Grand Falls system.

Carlisle.—SPECIAL ORDER.—The Corporation Electricity Committee is to make application to the Electricity Commissioners for an Order for the extension of its supply area to the parishes of Upper Denton, Burtholme, Waterhead, Askerton, and Kingwater, in the rural district of Brampton and the parishes of Stapleton Solport, Nicholforest, Trough, Bellbank, and Bewcastle, in the rural district of Longtown.

Continental.—SWITZERLAND.—Plans are being prepared for a new hydro-electric power station in the Canton of Wallis. The scheme will entail the conversion of the Dixence Valley into a lake capable of storing over 1,100 million gallons of water.

GERMANY.—According to *E.T.Z.* the output of the 122 principal electric power stations in Germany during May last amounted to 1,302 million kWh, bringing the total for the first five months of the year to 6,632 million kWh, as compared with 5,668 million kWh in the corresponding period of 1928.

Driffield.—ELECTRICITY SCHEME.—The Rural District Council has decided to withdraw its opposition to the electricity scheme for the Buckrose area promoted by the Holderness Trust, Ltd., and to give formal consent to the proposed Order.

Grimsby.—YEAR'S WORKING.—The report on the working of the Corporation Electricity Department (borough electrical engineer: Mr. S. R. Windle) for the year ended March 31st last records a total income of £99,671, as compared with £100,700 in the preceding year. Working expenses totalled £53,189, as against £53,337, leaving a gross profit of £46,482 (£47,364), to which was added income from other sources, making £46,785 available. After deducting capital and other charges there was a net surplus of £15,752, as compared with £19,277 in 1927-28. The capital expenditure during the year amounted to £26,776, of which the chief item was £13,791 for mains and services. The total now spent on the undertaking stands at £528,541. The sales of electricity for all purposes increased from 14,620,593 to 15,857,764 kWh and the maximum supply demanded from 6,290 to 6,344 kW. The average price obtained per kWh fell from 1.56d. to 1.51d.

Guildford.—ELECTRICITY SUPPLY.—At a meeting of the Corporation Electricity Committee, held recently, the borough electrical engineer submitted his report in connection with the application from the Edmundson's Electricity Corporation, Dorking, for a supply of electricity to residents in Abinger Hammer and district, outside the Corporation's area of supply. The company estimated that the present demand would be approximately 10 kW, increasing to 20 kW within a period of 12 months. In view of the small load required, the engineer recommended that the supply be given on the terms and conditions mentioned. The Committee agreed to the recommendation.

Heckmondwike.—PRICE REDUCTION.—The Urban District Council has decided to make a reduction of 1d. per kWh in the price of electricity for lighting purposes, bringing the charge to 4d. per kWh.

Irish Free State.—WEXFORD.—The Corporation has approved a recommendation of the Lighting Committee to accept the quotation of the Electricity Supply Board for the lighting of the town up to March 31st, 1930, for the sum of £450.

Leominster.—ELECTRICITY SUPPLY.—The Rural District Council has given its consent to an application by the Leominster Electric Supply Co., Ltd., to supply electricity to the parish of Kingsland, which is outside the area included in the Order of 1911.

London.—POPLAR.—*Year's Working.*—We have received from Mr. J. Horace Bowden, general manager and chief engineer of the borough electricity undertaking, a copy of his report, together with a statement of accounts of the undertaking, for the year ended March 31st last. The total revenue amounted to £246,794, as compared with £231,296 in the preceding year, and working expenditure increased from £142,984 to £146,844. The gross profit was £99,945, as against £88,312, and to this was added various small amounts from other sources, making a total of £100,663 available. Of this, £53,545 was absorbed by loan redemption, £32,666 by interest on loans, and £604 by miscellaneous charges, leaving a net surplus of £13,848, as compared with £1,900 in 1927-28. The capital expenditure during the year amounted to £38,261, making the total sum now spent on the undertaking £1,288,830. The electrical energy sold increased from 36,372,747 to 39,266,427 kWh and the maximum supply demanded from 17,370 to 18,450 kW.

Louth.—Loan.—The Town Council has decided to apply for sanction to a loan of £27,000, in connection with the bulk supply of electricity to be purchased from the Grimsby Corporation.

Paul.—Electricity Supply.—The Urban District Council has granted the application of the West Cornwall Electricity Supply Co., Ltd., for the necessary power to supply Mousehole and Paul with electric lighting.

Reigate.—Loan.—The Town Council has applied for sanction to a loan of £5,200 for the laying of a new h.p. feeder from the electricity works to Redhill.

Bulk Supply.—The Council has instructed the town clerk to make inquiries from the Electricity Commissioners concerning a bulk supply of electricity as from the autumn of 1930.

Hire-Purchase Scheme.—The Council has accepted the offer of the Electricity Committee to lay mains and to wire houses on the Redstone site, under a hire-purchase scheme, at a cost to the Housing Committee of £2 per house.

Southampton. — Year's Working. — A total revenue of £234,087, as compared with £221,642 in the preceding year, is shown in the report of the Corporation Electricity Department (engineer: Mr. W. G. Turner) for the year ended March 31st last. The working expenditure totalled £124,695, as against £116,689, leaving a gross profit of £109,393 (£104,952). After making allowance for capital and other charges, there was a net surplus of £41,438, as compared with £41,421 in 1927-28. A contribution of £8,500 was made to the relief of the rates. The capital expenditure during the year amounted to £64,621, and included £44,828 for mains. The total capital expenditure on the undertaking now stands at £1,111,877. The sales of electricity increased from 26,487,488 to 31,946,362 kWh, and maximum supply demanded from 15,420 to 15,820 kW.

Stockport.—Loans.—The Town Council has applied for sanction to the following loans:—£100,000 for mains extensions and services; £7,000 for meters; £10,000 for the equipment of sub-stations on consumers' premises; £36,000 for changing over to a.c. in Davenport and Heaton Norris districts; and £10,000 for changing apparatus on consumers' premises. A loan is also to be sought for the replacement of a turbine.

Stoke-on-Trent.—Bulk Supply.—The Electricity Committee has agreed to give a bulk supply to the Mossfield and Parkhall collieries at the rate of £3 per kVA per annum, plus ¼d. per kWh for electrical energy consumed, on a coal basis price of 15s. per ton, subject to 0.015d. per kWh increase or decrease for each rise or fall of 1s. per ton in the cost of coal. The agreement is made, subject to arrangements being made for the supply to be taken from the transmission line to Leek.

Fixed-price Scheme.—At a recent meeting of the Corporation Housing Committee, the city surveyor reported that the Electricity Supply Committee was prepared to supply electricity to the houses to be erected on the Vivian Road site, Fenton, at a fixed price of 1s. per week for an agreed number of suitably-sized lamps in each house, and desired the Housing Committee to arrange for the collection of this amount each week with the rent. The proposals of the Electricity Supply Committee were approved and the city treasurer was instructed to make the necessary arrangements in due course, it being understood that the Electricity Supply Committee would be responsible for arrears, if any, incurred under this arrangement.

Supply to Works.—In connection with the supply of electricity at the new works of Messrs. Twyfords, Ltd., to be erected in Garner Street, Cliffe Vale, the Corporation Electricity Committee has agreed to consider favourably the question of the provision of the necessary mains and sub-station equipment, subject to their providing or selling a site for a sub-station and guaranteeing to consume electrical energy to the value of at least £500 per annum.

Mains Extensions.—The Corporation Electricity Committee has decided to lay l.p. mains to supply houses in Blurton Road and Heron Street, Fenton, at a cost of £1,600. Cables are also to be laid from the central power house to the Newcastle boundary, in connection with the supply to the Hill Farm estate, Newcastle.

Thirsk.—Public Lighting.—The Parish Council has accepted the tender of the Northern Counties Electricity Supply Co., Ltd., for public lighting with 108 lamps at £406 from September 8th to April 12th next.

United States.—Electrical Developments.—It is stated by *Power* that construction will shortly be started on a new steam-electric power plant that will add more than 100,000 h.p. to the electrical resources of the Buffalo, Niagara & Eastern Power Company. The new plant will be situated on the Niagara River, and will be operated in conjunction with the Charles R. Huntley station of the Buffalo General Electric Co. The capacity of the Huntley station is now over 300,000 h.p., and with the completion of the new plant, the power generated by steam at Buffalo will practically equal that of the hydro-electric plant on the American side at Niagara Falls, which is the main generating station of the system. Three boilers fired by powdered coal will be installed, and space will be provided for a fourth. Each one will be capable of generating 560,000 lb. of steam per hour, and will consume about 30 tons of coal an hour when operating at its full capacity. Work on the plant will be started this autumn, so that its output will be available as the demand rises above the present capacity of the system.

Walton-on-Thames. — New Electricity Charge.—The Urban District Council has added to its list of electricity tariffs an alternative domestic scale of 1½d. per kWh for cooking, or cooking and heating combined.

Cooking Appliances.—The Council has authorised the purchase of electric cooking appliances and cookers, at a cost of £650, and the expenditure of £100 for publicity purposes. The Council has also accepted the offer of the Electricity Committee to install electric cookers at £2 per house, with a charge of 1½d. per kWh, to include hire of cooker, kettle, and meter, or no charge for installation and 2d. per kWh to cover hire of cooker, kettle, and meter.

Welton.—Electricity Supply.—The Yorkshire Electric Power Co. has applied to the Rural District Council for its consent to supply electricity in the parishes of Caenby, Normanby, Ownby, Saxby, East and West Firsby, Ingham, Spridlington, and Faldingworth. The Council has decided to take no action in the matter for the present.

Yarmouth.—Bulk Supply.—At a meeting of the Corporation held recently the arrangements made with Electrical Enterprise, Ltd., to supply electricity in bulk to Bungay were approved, subject to the necessary consent being obtained from the Electricity Commissioners.

Tramway and Railway Notes.

Accrington.—Tramway Abandonment.—The representatives of the Accrington, Rawtenstall, and Bacup Corporations have agreed that a day near April 1st, 1930, be fixed for the discontinuance of the tramway service and the substitution of motor-'buses.

Blackpool.—Termination of Agreement.—The Tramways Committee has given notice to the Lytham-St. Annes Corporation terminating the present through-running agreement over the Blackpool Corporation tramways.

Dover.—Extension of Time.—The Dover, St. Margaret's and Martin Mill Light Railway Co. is to apply to the Ministry of Transport for a prolongation of the time limited for the completion of the works authorised by the Dover, St. Margaret's and Martin Mill Light Railways Order, 1909, until October 11th, 1930.

Glasgow.—New Plant.—At a recent meeting of the Corporation, the Tramways Committee recommended that, following the Electricity Commissioners' decision to refuse their consent to the installation of a new 18,750-kW turbo-alternator in the Pinkston generating station, plant should be installed to replace existing plant, at an estimated cost of £218,500. An amendment that the matter should be remitted to a special committtee for investigation and report, and that the Committee should have power to call in experts, was defeated and the recommendation was approved.

Irish Free State.—Dublin.—As a result of the refusal of the employés of the Dublin United Tramways Co. to accept a 10 per cent. reduction in wages, 2,000 tram and 'bus men came out on strike on August 15th.

Oldham.—Year's Working.—The report on the working of the Corporation Tramways Department (general manager and engineer: Mr. C. Jackson) for the year ended March 25th last shows a total revenue of £207,061, as compared with £225,720 in the preceding year. The working expenses amounted to £168,046, as against £188,950, leaving a gross profit of £39,015 (£36,770). To the gross revenue was added income from other sources, making a total of £44,591 available, and after deducting capital charges, &c., there was a net surplus of £5,474, as compared with £4,017 in 1927-28. The number of passengers carried increased from 34,916,106 to 35,091,134, but the car-miles decreased from 2,821,437 to 2,712,132. The average total revenue per car-mile fell from 19.210d. to 18.323d.

Siam.—Railway Electrification.—One of the Swedish engineers who will attend to the electrification of the railways in Siam has now been selected. The appointment has been given to Mr. G. Hagrup, of the Swedish Water Power Bureau, who will leave for Siam on October 1st, and will deal with the hydro-electric works. It is stated that two other Swedish engineers are to be engaged to attend to the purely electro-technical arrangements in connection with the re-organisation of the railway network.

Sunderland.—Relaying of Track.—The Corporation has decided to relay half of its 21 miles of tramway track, at a cost of over £70,000, and to reorganise its tramway service.

Thornaby-on-Tees.—Extension of Time.—The Ministry of Transport has further prolonged the period limited for the substantial commencement of the works and for the completion of the tramway authorised by Thornaby-on-Tees Corporation Tramways Order, 1919, from August 15th, 1929, to August 15th, 1930.

Telegraph and Telephone Notes.

Australia.—RADIO-TELEGRAPHY.—The report of the Select Committee of the Senate, which has been investigating the desirability and commercial possibility of beam messages to England at a penny a word, has tabled its report in the Senate. It recommends the Federal Ministry immediately to inaugurate a system of post and letter telegrams at 1½d. a word, with a minimum of sixteen words. The report recommends that the wireless stations should be Government-owned, and that overseas telegraph communication should be Government controlled. The committee is of the opinion that the cable and beam radio-telegraph services are equally reliable, the difference in the cost being to the advantage of the beam, and adds that there is no doubt that if the beam rates were reduced the cable rates would follow suit. The committee considers that a merger would delay the coming into force of cheap communication, and concludes its report by recommending that Parliament should discuss the whole question before becoming a party to any such merger.—*Reuter* (Canberra).

Channel Islands.—TELEPHONY.—The National Federation of Fruit and Potato Trades Associations, at whose executive committee meeting in London last month the need for a telephone service to the Channel Islands was discussed, reports that the Postmaster-General has declined to receive a deputation on the subject. The Federation has been informed, however, that the subject is already under consideration by the technical staffs of the G.P.O. and the Island telephone authorities. The committee feels that, in view of the delays attending the interchange of telegrams during the fruit season, telephone communication with the mainland would be of great assistance in relieving congestion, and it has therefore decided to urge again the necessity for a cable to be laid in time for use before next season.

East Africa.—KENYA TELEGRAPH SERVICE.—At the August meeting of the Executive Council of the Joint East African Board, the chairman reported that it had been agreed on behalf of the Eastern Telegraph Co. that, if the Kenya Government would provide it with accommodation in the new Post Office buildings at Mombasa, the company would forego its claim to the extra 2 cents per message on terminal charges, and thus arrive at a definite agreement for the installation of its service in Kenya. The Association of Chambers of Commerce in Eastern Africa had petitioned the Board to take action in this matter, and Sir Basil Blackett, head of the Imperial Communications Co., had agreed that this question should be finally settled without further delay.

Russia.—WIRELESS STATION IN THE ARCTIC.—The official Soviet Tass agency states that the Soviet expedition to Franz Josef Land has inspected the coasts of the different islands constituting the archipelago and has decided to build a wireless station in the Bay of Tikhaya, on Hooker Island. The position of the proposed station is longitude 80.19 degrees, latitude 52.48 degrees. The expedition has already begun to unload materials from an icebreaker.—*Reuter's* (Moscow).

The Telegraph Service.—LIVERPOOL.—Delays in the Liverpool-London telegraph service were mentioned again recently at a meeting of the Council of the Liverpool Chamber of Commerce.

The Liverpool and District Postal, Telegraph, and Telephone Advisory Committee reported that an additional number of instances of delay was recently discussed with the Postmaster Surveyor, who stated that he had made a detailed report to headquarters, as a result of which additional channels of communication had been opened between Liverpool and London, with an additional staff.

The Telephone Service.—RURAL RENTAL.—As from the beginning of the present quarter, all rural telephone subscribers within two miles from their exchange will receive the benefit of the minimum rental installation. The minimum installation rental has hitherto been charged to all subscribers living within 1½ miles from an exchange.

MANX TRAFFIC.—The traffic on the recently-laid telephone cable between the Isle of Man and England has become so great that it has been found necessary to utilise another circuit in addition to the two already in use. The third line will connect Douglas with the Manchester exchange.

DOCK TELEPHONES.—The establishment of telephone communication between cargo ships in dock and seaport exchanges is suggested by Mr. A. J. Stewart, district manager of the Newcastle telephones, who states that, with a special system of plugs along the dockside and flexible cables complete with receivers, connections could be established as required. In Newcastle and other trading ports the establishment of ship telephones would facilitate the rapid handling of cargoes by putting a ship in instant communication with its company's offices ashore.

Radio Notes.

Canada.—RELAYS.—This winter will see the completion of arrangements made by the Canadian National Railways for the regular relaying of weekly programmes from the Atlantic to the Pacific coast, a distance of 3,500 miles. The company will use 15,000 miles of telegraph and telephone wires, and will link 16 broadcasting stations, 13 of which, as the largest single broadcasting organisation in Canada, it owns or operates direct.

Denmark.—LICENCES.—The first Danish public broadcast transmission took place in October, 1922; to-day some 230,000 duly licensed receiving sets are in use. The control of the broadcasting service on the administrative side is in the hands of a council of nine appointed by the First Commissioner of Public Works, while the technical side is superintended by the Postmaster-General. Shortly before April, 1926, when State broadcasting became an accomplished fact, new offices were obtained, with a studio. The annual fee is at present approximately 11s.

Norway.—AMERICAN PATENTS.—According to *Aftenposten*, a number of leading American wireless manufacturing companies allege that 500 Norwegian wireless manufacturers and dealers have been using American patents in the manufacture of sets without their authorisation, and they demand compensation for all sets which have already been sold and for all apparatus embodying American patents used in wireless stations. They further demand that a royalty be imposed and paid to them if the Norwegian firms wish to make use of their patents.—*Reuter's* (Oslo).

Spain.—TENDERS FOR CONTROL OF SERVICE.—In a decree published on July 26th the Government announces the conditions under which tenders are invited for the control of the whole of the broadcasting service in Spain. There are to be transmitting stations in eighteen of the principal towns; the central station in Madrid is to be of 20 kW, that at Barcelona of 10 kW, and the others between 0.5 and 3 kW. Madrid is also to have a short-wave transmitter not exceeding 40 kW with a wave length less than 100 metres, intended for transmission to the Spanish-speaking South American countries. The successful tenderer will be called upon to complete the network of stations within two years. Revenue will be assured, within the limits of a maximum rate of interest on capital and sinking fund, by a tax of one peseta (8d.) quarterly on each crystal receiver and 5 pesetas quarterly on each valve set, plus five per cent. on the sale price of all instruments and accessories. The Boardcasting Company is to be entitled to 90 per cent. of the whole of the receipts from these sources, and authorised to collect a revenue on advertisements, the transmission of which, however, is not to exceed 100 words per hour. The 10 per cent. remaining of the revenue from the taxes will be retained by the Government for administration expenses.

According to *World-Radio*, the share capital can be held only by persons of Spanish nationality, and 90 per cent. of the administrative and technical staff must be of Spanish nationality. Any existing stations may be taken over at an approved valuation by the successful tenderer.

Contract Information.

When "Contracts Open" are advertised in our "Official Notice" pages, the date of the ELECTRICAL REVIEW containing the advertisement is given in parentheses below.

Contracts Open.

Alderley Edge and Wilmslow.—August 30th. Electricity Board. 2,200 a.c. house service meters. Mr. E. Hesketh, electrical engineer and manager, Electricity Works, Alderley Edge.

Australia.—MELBOURNE.—September 30th. State Electricity Commission. Three 3,000-kVA transformers and spares. (B.X. 5523.)*

October 7th. 11,000-V three-core cable. (B.X.5539.)*

October 1st. Posts and Telegraphs Department. Switchboard cords. (B.X. 5515.)*

October 15th. Switchboard instruments, test plugs and sleeves. (B.X. 5541.)*

October 22nd. Telephone transformers (B.X. 5581)* Insulated wire (B.X. 5580.)*

October 30th. City Council. Two 2,500-kW motor convertors and accessories or, alternatively, two 2,500-kW rotary convertors, with transformers and accessories. (B.X. 5570.)*

Perth (W.A.).—November 29th. Western Australian Government. Complete boiler-house equipment, one 12,500-kW turbo-generator, and condensing plant. (August 16th.)

Blackpool.—Electricity Department. Supply during the next 12 months of electricity meters. Particulars from Mr. C. Furness, borough electrical engineer. (See this issue.)

Brighton.—August 27th. Guardians of the Poor. Supply and fitting of electric lighting equipment in the nurses' home, Poor Law Infirmary. Copy of specification and form of tender from the clerk to the Guardians, Poor Law Offices, Prince's Street, Brighton.

Bury.—August 31st. Installation of electric refrigerator at Florence Nightingale Hospital and the Aitken Sanatorium, Holcombe. Tenders to Mr. F. Wild, clerk to the Bury and District Joint Hospital Board, 2, Cross Street, Bury.

Doncaster.—August 30th. Education Committee. Installation of electric lighting at Highfields Council school. Specifications from Mr. A. J. Dempster, divisional clerk, Education Offices, Christchurch Road, Doncaster.

Egypt.—October 16th. Ministry of the Interior. Electric motors, pumps, mechanical filters, &c. (A.X. 8373.)*

October 1st. Supply and erection of a 500-kVA power station, with underground and overhead networks, for the town of Menouf. (B.X. 5567.)*

Haddington.—September 7th. East Lothian Educatian Authority. Electrical installation at the new public schools at Aberlady and Longouddry. Schedules, &c., from Morham and Brotchie, surveyors, 29, Hanover Street, Edinburgh.

Harrogate.—September 7th. Electricity Department. Supply, delivery, and erection of overhead 11,000-V, and 346/200-V lines. (August 16th.)

Irish Free State.—Waterford.—Supply, laying, and fixing of light standards, poles, cables, lamps, &c., on and adjoining the deep water wharf, for the Waterford Harbour Board. Harbour Engineer, Engineer's Office, Waterford. (Returnable deposit £2.)

Leyton.—September 13th. Corporation. Installation of electric lighting and hot-water heating apparatus at Canterbury Road school. (See this issue.)

Liverpool.—September 10th. Corporation. Electric lighting and power scheme for the new abattoir, Stanley. Specification from the Land Steward and Surveyor, Municipal Buildings, Liverpool.

London. — Central Electricity Board. — August 31st. Supply, delivery, and erection of 132,000-V outdoor switchgear for the Mid-East England Electricity Scheme, 1929. (July 19th.)

September 11th. Supply, delivery, and erection of 132-kV overhead transmission lines (approach to Clarence Dock, Liverpool). (August 2nd.)

London County Council.—September 9th. Supply and erection of e.h.p. switchgear, &c., for tramway sub-stations. (August 9th.)

Poplar.—August 28th. Board of Guardians. E.h.p. switchgear, 75-kW mercury-arc rectifier, and l.p. d.c. switchboard at the Institution. (August 2nd.)

Woolwich.—September 4th. Union Guardians. Refrigerating plant at the Plumstead and District Hospital. (August 16th.)

Louth.—September 9th. Corporation. Mains and steelwork, and outdoor and indoor sub-station equipment. (See this issue.)

Manchester.—August 30th. Electricity Committee. One 130,000-lb. water-tube boiler, superheater, &c. (August 2nd.)

New Mills.—September 9th. Urban District Council. Electrical equipment, comprising e.h.p. and l.p. switchgear, cables, feeder pillars, &c. (August 16th.)

New Zealand.—Wellington.—Post and Telegraph Department. October 1st. Telephone bolts, brackets, &c. (B.X. 5560.)

October 15th. Resistances. (B.X. 5551.)* Coils. B.X. 5552.)*

October 16th. Supply and delivery of automatic wall and table telephones. (B.X. 5509.)*

Corporation. September 30th. Electric motors, starters and switchgear for the Milk Department. (B.X. 5508.)*

Invercargill.—September 23rd. Corporation. Supply and delivery of an 11,000-V, 3-phase, 50-cycle switchboard. (B.X. 5507.)*

Marlborough.—September 28th. Electric Power Board. 600-b.h.p. Diesel-driven generating plant and switchgear. (B.X. 5556.)*

Oldham.—September 9th. Board of Guardians. Electric lamps required at Poor Law Institution, Rochdale Road. Specifications, &c., from Mr. F. W. Fletcher, clerk to the Guardians, Union Offices.

Plymouth.—August 30th. Corporation. Supply, as required by the various departments, of electrician's ironmongery, &c. Tenders on official forms to Mr. R. J. Fittall, town clerk, Municipal Offices.

Portsmouth.—Electricity Department. Supply, delivery, and installation of armour-clad e.h.p. switchgear at the generating station. (August 16th.)

Scarborough.—September 7th. Electricity Department. Supply and erection of e.h.p. and l.p. overhead lines, and supply of e.h.p. and l.p. paper-insulated cable. (August 16th.)

South Africa.—Cape Town.—September 4th. Town Council. Overhead line material. (A.X. 8334.)*

Mafeking.—September 9th. Municipal Council. Steam-raising plant, engine-alternators, chimney, and switchgear. (A.X. 8352.)*

Johannesburg.—September 30th. South African Railways and Harbours. Twelve months' supply of electric lamps. (B.X. 5590.)*

September 26th. Two 100-kVA motor-alternator sets. (B.X. 5564.)*

September 23rd. One 150-kW crude-oil engine-driven electric generating plant. (B.X. 5566.)*

Smyrna.—Municipal Council. Construction and equipment of a modern electric bakehouse. (B.X. 5572.)*

Tiverton.—August 31st. Town Council. Supply, delivery, and erection, on foundations provided by the Council, of one 150-kW semi-Diesel crude-oil engine and direct-coupled d.c. generator, 460 V, complete. (See this issue.)

Torquay.—August 28th. Corporation. Supply and delivery of coal at the power station, Newton Abbot, for a period commencing September 1st next. (See this issue.)

Uruguay.—Montevideo.—October 17th. National Administration of the Port. Electric trucks, 1,500 to 2,000 kilogs. capacity, with auxiliary platforms, electric generating sets, and spares. (A.X. 8353.)*

Walsall and West Bromwich.—August 29th. Board of Guardians. Electrical fittings required during six months ending March 31st, 1930. Particulars from Mr. A. H. Ward, clerk to the Guardians, 22, Lombard Street, West Bromwich.

Warrington.—September 2nd. Electricity Department. Twelve months' supply of e.h.p. and l.p. paper- and lead-covered cables, earthenware conduits, cable protector slabs and tiles, and hard burned red tiles. (August 16th.)

Waterford.—August 31st. Harbour Commissioners. Supply of light standards, poles, cables, and lamps. Specification, &c., Harbour Engineer.

West Ham.—September 16th. Education Committee. Installation of electric light and water heating apparatus at Plaistow secondary school now in course of erection. (August 16th.)

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* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed.

Belgium.—Belgian, German, French, Dutch and British (British Insulated Cables, Ltd.) firms submitted tenders to the municipal authorities of Saint Gilles, Brussels, on August 5th, for the supply of 8,550 metres of armoured cable, 3,550 kilog. of bare, hammered copper cable, and 500 kilog. of bare copper wire. The tenders ranged from 514,825 to 729,616 fr., the lowest being that of the Société des Cableries et Corderies du Hainaut, of Dour, Belgium.

Coulsdon.—U.D.C. Housing Committee. Accepted :—
Wiring houses in course of construction in Farleigh Road (£148).—County of London Electric Supply Co., Ltd.

Croydon.—Hospitals Committee. Recommended :—
Electric light installation at borough hospital (£206).—Kingsdown Electrical Co.

Eaton Bray.—Rural Council. Accepted :—
Wiring 34 houses for electric light at Stanbridge and Eaton Bray (£214).—Griffin Bros.

Hornsey.—Electricity Committee. Recommended :—
Hewittic balancer for Oakfield Road sub-station (£1,308).—Hewittic Electric Co., Ltd.

London.—Metropolitan Water Board :—
12 months' supply of Osram lamps.—General Electric Co., Ltd.

Manchester.—Electricity Committee. Materials for 12 months:—

Cable.—Connollys (Blackley), Ltd.; Johnson & Phillips, Ltd.; Pirelli-General Cable Works, Ltd.; Macintosh Cable Co., Ltd.; Standard Telephones and Cables, Ltd.; W. T. Glover & Co., Ltd.

Adhesive tape.—L. Andrew & Co.

Box compound.—British Insulated Cables, Ltd.

Cable covers and tiles.—H. J. Baldwin & Co.; S. H. Bonsall; Callender's Cable and Construction Co., Ltd.; Catherall & Co., Ltd.; Concrete Unit Co., Ltd.; Doulton & Co., Ltd.; Drury Brick Works, Ltd.; Isherwood Bros., Ltd.; Pearson Bros. & Co., Ltd.

Conduit and accessories for wiring.—Simplex Conduits, Ltd.

Dry batteries.—General Electric Co., Ltd.

Fuse boxes.—W. Lucy & Co., Ltd.; Siemens Bros. and Co., Ltd.; Sykes & Dyson, Ltd.

Insulating cloth.—Ioco Rubber and Waterproofing Co., Ltd.

Insulators.—Doulton & Co., Ltd.; Gaskell & Grocott; W. Kent; J. Macintyre & Co., Ltd.; Metro-Vick Supplies; Taylor, Tunnicliffe & Co.

Street lanterns.—General Electric Co., Ltd.; Wardle Engineering Co., Ltd.

Tapes.—Callender's Cable and Construction Co., Ltd.; H. Clarke & Co. (Manchester), Ltd.; Siemens Bros. and Co., Ltd.

Transformers and balancers.—British Electric Transformer Co., Ltd.; General Electric Co., Ltd.

Trifurcating boxes.—British Insulated Cables, Ltd.; Forrest & Sym; Sykes & Dyson, Ltd.

Wires (cotton and silk covered).—London Electric Wire Co. & Smiths, Ltd.

Wire (tinned copper and pure tin fuse).—Hawkins Bros. and Co., Ltd.

Wire (tinned steel binding).—Bruntons.

Cable troughing, capping, and boards.—Palmer Hall Timber Co., Ltd.

Portsmouth.—Electricity Committee:—
Four kiosk sub-stations:—

Crompton Parkinson, Ltd.	... £1,010
Metropolitan-Vickers Electrical Co., Ltd.	... 1,017
ENGLISH ELECTRIC CO., LTD. (Accepted)	... 1,080
Johnson & Phillips, Ltd.	... 1,147
General Electric Co., Ltd.	... 1,368

Shardlow.—Board of Guardians. Accepted:—
Installing electric light at the institution.—Messrs. Knight.

Sunderland.—Town Council. Accepted:—
Gasfilled and vacuum lamps.—General Electric Co., Ltd.
Meters.—Ferranti, Ltd.
Cable.—Pirelli-General Cable Works, Ltd.; British Insulated Cables, Ltd.
V.i.r. flexibles.—General Electric Co., Ltd,
V.i.r. wire.—Edison Swan Electric Co., Ltd.

Woodhouses.—Accepted:—
Installing electric light at Woodhouses church schools.—Caton & Sons (Oldham).

Notes.

The M.S. "Britannic."

The White Star Co.'s new liner *Britannic*, claimed to be the largest motor ship in the world, was successfully launched at the Queen's Island, Belfast, at Messrs. Harland and Wolff's works, on August 6th. The *Britannic* measures 680 ft. in length, has a beam of 82 ft., a depth of 43 ft., and gross tonnage of 26,840. She will provide accommodation for 1,550 passengers, and throughout is up-to-date in elaborate finish and detail. The vessel has an interesting electrical installation, energy being furnished by four Diesel-driven generators having a combined capacity of 2,000 kW, situated in a separate compartment next to the main engine room, and a 75-kW Diesel-driven emergency generator, situated above the margin line. The cooking throughout is carried out electrically, including the main ranges and also such supplementary appliances as grills, roasters, fish friers, salamanders, griddle plates, and hot presses; the baker's oven, together with the oven in the confectioner's shop, is also electrically operated. The ventilation is provided by about 75 electrically-driven pressure fans, ranging in size from 10 to 55 in. in diameter; the fans include a number fitted with heating elements, by means of which the vessel can be kept comfortably warm in the coldest weather which may be experienced *en route*, the air-heating fans being supplemented by electric heaters distributed throughout the accommodation. The deck machinery includes sixteen electrically-driven winches, steering gear, four large capstans, and two large warping winches. Each of the four capstans is driven by a 170-h.p. motor, each of the after capstans by a 100-h.p. motor, and each of the warping winches by a 105-h.p. motor. In addition, a number of service motors drive such apparatus as dough mixers, potato peelers, dish washers, elevators, store hoist, pantry hoist, ice-rocking machine, and silver-cleaning machine. There is also a very complete wireless installation and two electrically-operated sounding machines.

All the engine-room auxiliaries, of which there are over 60, are electrically operated, the individual horse power for driving the pumps varying from 100 down to 2½. For the call-bell system, instead of the usual bell indicators, there are installed outside each stateroom two small electric lamps, one coloured red for the steward and the other green for the stewardess. They are operated by similarly coloured pushes in each stateroom, and the lamps remain lit until the attending steward or stewardess operates the push, which is fixed outside each stateroom door. Tell-tale lights are also placed in central positions throughout the vessel, not only to indicate the deck on which a call has been made, but also to guide the attendant to the stateroom. By this means it is anticipated that a very efficient and silent service will be maintained. The extent of the lighting may be gathered from the fact that the equivalent of over 7,000 30-watt lamps is installed throughout the ship.

The propelling machinery, which has been constructed by Messrs. Harland & Wolff, consists of two ten-cylinder, double-acting, four-cycle, oil engines of the Harland-B. & W. type, the cylinders being cooled by fresh water and the pistons by oil. Four independent injection air compressors, each driven by four-cylinder trunk-type motors of the same make, are fitted, and these also supply air to four reservoirs for manœuvring purposes. Four generators have been arranged to supply the necessary electric power for engine-room and ship's purposes, and are driven by six-cylinder trunk motors of the same general type as the air compressors. One small steam-driven emergency compressor is also fitted. Four main engine exhaust-gas-fired boilers will generate steam at sea, also one auxiliary engine exhaust-gas-fired boiler and two cylindrical single-ended boilers, oil-fired only, will be available for generating steam in port and at sea for heating and cooking purposes.

The A.S.E.E. and the Engineering Exhibition.

At the invitation of the authorities of the Shipping, Engineering and Machinery Exhibition, Olympia, the Association of Supervising Electrical Engineers is paying an official visit to the Exhibition on Saturday, September 21st. The programme is as follows: 1 p.m.—The president, past-presidents and the Board of Control will lunch with the Exhibition authorities; 2.15 p.m.—Reception and registration arrangements; 3 p.m.—Conference, at which a paper will be given on "Electricity as Applied to Modern Commercial Shipping," by Mr. E. M. Johnson; 4.45 p.m.—Members and associates will take tea with the Exhibition authorities; 5.30 p.m.—Official inspection of the Exhibition.

The Association, in arranging for the paper on "Electricity as Applied to Modern Commercial Shipping," has in mind the important developments which are taking place in this connection, and the need for further publicity and education with regard to the matter.

Inquest.

In the Westminster Coroner's Court on August 13th, Mr. Ingleby Oddie held an inquest into the death of William Charles Goodall, aged 63, an electric linesman employed for 43 years by the London Electric Supply Corporation. Frederick Bates, assistant linesman, deposed that on the morning of August 9th he and Goodall went to 13, Conduit Street, to examine an electric transformer. There was a chamber in the area just off the street outside the house, and it contained a transformer, electric cable, a fuse box, and safety device. Goodall opened the chamber, lit some candles, put on rubber gloves, and put the primary switch to "off," which cut off the current from the premises. He removed the ebonite fuse cover, which had two knobs for lifting and would sometimes stick. Goodall asked for a pair of pliers, and witness imagined he was going to disconnect the lead from a safety device. He had never known him to use pliers for prising off the lid of a fuse box. "Before I gave him the pliers I saw a reflection, a flash, and heard an explosion," continued Bates, "and saw Goodall lying across the transformer in a collapsed condition."

The Coroner: If you were taking a fuse cover off you might get a flash?—Yes.

Have you known him to take off a fuse-box cover without wearing rubber gloves?—No, sir.

Witness added that he did not know what Goodall was doing when he was getting the pliers. Goodall was a very experienced man.

Dr. H. B. Weir, pathologist, said the man died from an electric shock, and he was of opinion that the point of contact was at the man's index and second fingers of the left hand. He was an unusually healthy man.

Mr. Arthur Priestley Hutchinson, assistant distributing engineer to the London Electric Supply Corporation, stated that it was very difficult to draw a definite conclusion as to what happened.

Addressing the Coroner, Mr. Swan, H.M. Factory Inspector, said he thought Goodall had in mind disconnecting the safety

device, but, in the meantime, thought he would have the fuse out as an additional precaution for his own safety. He (Mr. Swan) added that he was of opinion that the cover stuck and his fingers came in contact with the contacts of the fuse.

The Coroner, summing up, said he had examined the place—it was impossible to understand the case unless one did—and he thought the explanation offered by Mr. Swan was the correct one. Goodall evidently forgot for a moment the dangerous thing he was doing, and it was due to an act of forgetfulness that he lost his life. Mr. Oddie recorded a verdict of accidental death through the man touching a live fuse box during the course of his employment.

[We regret that in our last week's reference to this fatal accident we inadvertently said that the man was employed by the London Electrical Co. and not the London Electric Supply Corporation, Ltd. The former company wishes its customers to understand that they are not competing with them in contracting or repair work. They are wholesalers only.]

The Batti-Wallahs' Luncheon.

The 1929-30 session of the Batti-Wallahs' Society will open with a luncheon on Tuesday, October 1st, at 1 p.m., at the Hotel Cecil, when Mr. George Balfour, M.P., M.I.E.E., M.I.Mech.E., will deliver an address.

"Fultograph" Service in Australia.

Subject to ratification by Wireless Pictures, Ltd., Amalgamated Wireless (Australasia), Ltd., which owns the majority of the important broadcasting stations in Australia, has concluded with Messrs. William Blogg & Co., Ltd., the "Fultograph" agents in that country, a five years' contract for a still-picture service. Transmissions from Melbourne are expected to begin shortly.

Notes on Electric Motor Installation.

The Union des Exploitations Electriques en Belgique, of Brussels, has recently issued some suggestions to those entrusted with the installation of electric motors, from which we take the following:—In view of the increasing use of electric motors in agricultural districts, it is most desirable that contracting electrical engineers should pay special attention to the type and power of the motors to be installed. It will be realised that in villages and country districts distribution cables are not of a size to allow the connecting up of any size of motor, or at any point in a village. Although of similar rating, there are many types of motors and starters which are likely to cause serious inconvenience to lighting consumers. There are also motors which, while they may be safely used in connection with big distribution systems in towns, are entirely unsuitable for rural service work. Many power supply undertakings are now refusing to connect up motors which, on starting, are prone to cause voltage variations with consequent serious inconvenience to lighting consumers, especially as it is possible to avoid such inconvenience by a judicious selection of motors and starting apparatus.

Attention is also drawn to a too general practice of not determining with sufficient accuracy the power of the motors necessary for a particular installation, the experience of the Union being that, in order to avoid trouble, contracting engineers, and also the owner of the installation, frequently put in motors of too high a power, which consequently work at a third or a quarter of their nominal capacity, and consequently prove anything but economical.

Italian Electrical Congress.

The annual congress of the Italian Association of Electrical Engineers is to be held at Pescara from September 22nd to 28th next. Among the papers to be read are one by Signor D. Civita on "The General Problems of the Use of Electricity in Agriculture," one by Signor M. Semenza on "Electric Ploughing," one by Signor C. Vanzetti on the "Industrial Applications of Electric Furnaces and Future Possibilities," one by L. Finzi on "Induction Electric Furnaces," and one by Signor G. Semenza on "Electric Cooking."

Navigation by Wireless.

The navigation of a ship from Finisterre to Liverpool through fog solely on wireless bearings is reported in a communication from the master of the motor vessel *Athelking*. The *Athelking* carries a Marconi direction finder, and, commenting upon the efficiency of coastal wireless beacon installations used in conjunction with the ship's direction finder, the captain states that he was able to take the usual four point bearings for some distance off in spite of the fog. The report again emphasises the valuable aid rendered to navigation by wireless beacon stations, two more of which have recently been completed by the Marconi Company for Trinity House. Installed at Cromer and Dungeness lighthouses, they will prove a very useful addition to the facilities available in the Channel and North Sea to ships equipped with wireless direction finders.

Electrical Standards for Motor Vehicles.

The Society of Motor Manufacturers and Traders, and the Institution of Automobile Engineers, have just issued a series of provisional standards in connection with the electrical equipment of motor vehicles. One sheet is devoted to a wiring colour code, in which it is recommended that positive wires should be coloured red, negative wires black, and field wires green. In the case of h.t. wires it is recommended that the following colour code be adopted where the constructional requirements, as in the case of engines for certain commercial vehicles, do not otherwise permit of ready identification by visual inspection: No. 1, red; No. 2, yellow; No. 3, black; No. 4, green; No. 5, brown; No. 6, blue; No. 7, orange; and No. 8, slate. Effect may be given to this recommendation by covering the 7-m.m. diameter cable normally used for h.t. ignition wires with a cotton sleeve, which should be impregnated subsequently with a cable-baking varnish of the appropriate colour. The overall diameter of cable so treated should not exceed 8 mm. The correct position of a cable coloured in accordance with this code may, if desired, be denoted by a small recess in the terminal, or at an adjacent point on the body of the component, spotted with the same colour as the cable. Another sheet sets out the dimensions of the body, and driving shafts of four sizes of lighting and starting dynamos for commercial vehicles, driven at either engine speed or 1½ times engine speed. A third sheet gives the recommended dimensions of the couplings for the foregoing dynamos. Finally, three sheets are devoted to revised provisional standards for B.A.S.-type tungsten filament (gasfilled and vacuum) electric lamps, these being issued in conjunction with the Electric Lamp Manufacturers' Association of Great Britain.

Appointments Vacant.

Plumber-jointer for Southend Corporation. Chief inspector, machine shop manager, production engineers, draughtsmen, testers and foreman, for Graham Amplion, Ltd. Assistant draughtsman, for Islington Borough Council. Assistant stoker and junior shift engineer, for Watford Corporation. Junior scientific officer in the Admiralty scientific pool at the Experimental Establishment, Portsmouth. Electrical engineer for the Government of Nigeria. Chief assistant engineer and meter repairer for Worcester Corporation. Electrical engineer and manager for Holywood Urban District Council. Overhead linesman for Hull Corporation. (See our advertisement pages to-day.)

Steel Railway Sleepers.

The railway companies are continuing experiments with steel sleepers with a view to their substitution for timber sleepers. The Southern Railway Company, which has been making tests for the past seven years, has already given an order for 70,000 steel sleepers (approximately 5,000 tons). Experiments of necessity require a long time, for the life of a timber sleeper is about 30 years and all the elements of value, including the "scrap value," have to be taken into account. Now that steel is declining in price, while timber has been on the upward trend, the use of steel is becoming more practicable. Tests conducted by the Great Western Railway Company as to the comparative costs a track mile of steel and timber sleepers showed that first costs, on a basis of 2,000 sleepers to the mile, gave a difference of £26 in favour of timber; but the scrap value showed a difference of £131 a mile in favour of steel, and there was also a difference in the net cost of renewal of £105 in favour of steel.

One other disadvantage of steel has to do with electrical track circuit-systems for signalling and safety devices, for these are dependent on good insulation between the two track rails. Again, in a damp climate like that of Britain, steel sleepers are liable to corrosion, and for that reason may have a shorter life than timber; but in hot countries steel is better than timber, especially where the latter is subject to attack by ants. It is contended, however, that none of these disadvantages is insuperable and that, broadly speaking, the whole question really turns on cost. Assuming that the price is reasonable, British steel would, of course, be used.

Shock-proof X-Ray Apparatus.

A new type of X-ray apparatus, completely insulated in oil and with all high-voltage wires entirely eliminated, has been installed in the Neurological Institute, New York. In appearance the apparatus resembles only remotely the X-ray apparatus now in general use. The Coolidge X-ray tube is concealed in an aluminium container filled with oil, and an adjustable slit diaphragm permits the passage of the invisible rays by which radiographs are made. The designer of the new device states that while X-ray apparatus has been reasonably safe in the past, the newly-developed apparatus is completely so from the electrical point of view. The complete insulation makes the new machine especially valuable when X-raying highly nervous patients and children. The absence of all overhead and exposed wiring carrying high voltages makes it possible to obtain X-ray photographs at angles hitherto impossible. Virtually any part of the patient's body may be X-rayed from any angle without moving the patient. Manipulation of the device to the patient's position replaces the shifting of the patient's position to suit the needs of the apparatus. Such manipulation is an invaluable aid when severely injured patients are being X-rayed. The movable part of the apparatus weighs about 500 lbs., yet it is so delicately balanced that it can be moved, literally, with the little finger. This feature, combined with the elimination of danger from contact with exposed wiring and the possibility of shock to operator or patient, makes it possible to obtain radiographs as rapidly as though a photographer were employing an ordinary high-speed camera. In a recent laboratory demonstration, 55 X-ray pictures were

made in four hours, all of uniform quality, as the timing of the exposures for various parts of the body has been carefully charted and made virtually automatic. By insulating the actual X-ray apparatus in oil, another scientific obstacle in röntgenology has been overcome. At high altitudes, such as occur in mountainous regions, X-ray apparatus of twice the power usually employed at sea level is necessary, because the higher altitudes decrease the capacity of the machine, but the new machine operates uniformly at all altitudes and is not affected by extremes in humidity. Encasing the machine further eliminates the noise which is usually associated with X-raying.

Institution of Electrical Engineers.

COUNCIL FOR THE YEAR 1929-30.—The scrutineers appointed at the ordinary meeting held on April 25th, 1929, have reported to the president that the result of the ballot to fill the vacancies which will occur in the Council on September 30th next is as follows:—

President: Colonel Sir T. F. Purves, O.B.E. Vice-president: Mr. B. Welbourn. Hon. Treasurer: Mr. E. Leete. Ordinary Members of Council: Members—Mr. A. R. Cooper, Mr. R. S. Whipple, Prof. E. Wilson. Associate Member—Mr. E. E. Sharp.

Our Personal Column.

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.

According to Press reports, Mr. W. C. LUSK has resigned the position of managing director of the British Thomson-Houston Co., Ltd., and has been elected chairman of the company. It is also stated that Mr. Lusk has been appointed deputy-chairman of Associated Electrical Industries, Ltd.

Last Friday Mr. A. E. ROOTS, chief assistant electrical engineer at Worcester, was appointed engineer and manager of Dumfries Council electricity works. There were 64 applicants for the position. The salary is £500, rising to £700. Mr. Roots is 36 years of age.

The marriage took place at Sherborne Abbey on August 14th of Mr. JOSEPH JACOB DAVIS, managing director of the Express Magneto Co., Ltd., of Yeovil, and Miss Muriel Mary Elliott, of Newland, Sherborne. The bridegroom received from his firm's staff an amber cut glass table centre-piece and trinket set, and from Petters, Ltd., a set of silver candlesticks.

The Marconiphone Company announce the appointment of Mr. J. H. WILLIAMS, who has had a wide experience of the radio trade, as sales manager. He first joined the company in the spring of 1922, acting as assistant branch manager at Manchester. Later he returned to London as sales representative for the South Eastern Counties, assuming the duties of assistant London manager in 1926. At the end of 1928 Mr. Williams became assistant sales manager.

The Douglas Town Council has granted the following increases in salary:—Mr. BERTRAM KELLY, borough electrical engineer, from £600 to £675 per annum; Mr. PERCY BREGAZZI, assistant engineer, from £320 to £370; Mr. R. M. CLAGUE, station superintendent, from £350 to £370.

The marriage took place on August 12th of Mr. WILLIAM A. PARKER, borough electrical engineer of Workington, and Miss Nellie Cusack, of Workington.

Mr. H. H. LANCASTER has been appointed traffic superintendent at Leeds at a salary of £600 per annum. He goes from a similar position at Blackpool, and is a son of the late Mr. John Lancaster, for many years general manager of Blackpool tramways.

Portsmouth Corporation Tramways Committee recommends that the salary of Mr. PEET, assistant engineer, be increased from £251 to £300 per annum.

Mrs. J. TYLER is relinquishing her position as honorary secretary of the South Wales and Monmouthshire branch of the Electrical Association for Women, and Mrs. Snow is succeeding her. Mrs. Tyler inaugurated the Electrical Association for Women in Cardiff about three years ago and will remain a member of the committee. She has returned to her duties with the South Wales Power Co.

The marriage took place recently at Pendleton of Mr. A. S. BARKER, of the Manchester Corporation Electricity Showrooms, and Miss W. HAGUE, of the General Electric Co., Ltd. The bridegroom is an old G.E.C. boy, and there were many electrical friends among the guests.

Obituary.—SIR E. R. LANKESTER, F.R.S.—We regret to record the death of Sir Edwin Ray Lankester, K.C.B., F.R.S., &c., the distinguished zoologist, which occurred in London on Thursday last week, at the age of 82 years. He was elected to the Royal Society in 1875, and was awarded the Royal Medal in 1885.

Mr. T. H. LAWTON.—The death occurred on August 9th, as the result of an accident, of Mr. Thomas Henry Lawton, partner in the firm of Lawton & Pascoe, electricians, of Douglas, Isle of Man. Mr. Lawton, who was 53 years of age, was engaged repairing the electrical installation on the *King Orry*, which was lying alongside the Victoria Pier, and when proceeding to the shore over a gangway composed of two planks he fell into the water, and his body was recovered the next morning. Prior to establishing his own business he was for a number of years with the Manx Electric Railway Co.

MR. E. W. HURST.—We regret to learn of the death of Mr. E. W. Hurst, who had represented Messrs. D. H. Bonnella & Son, Ltd., for several years and was much respected in the trade.

Mr. A. K. BAYLOR.—The *Electrical World* reports the death of Mr. Armistead Keith Baylor, who was connected with the American electrical industry for many years. From 1896 to 1910 he was manager of the traction department of the British Thomson-Houston Co., Ltd., becoming sales manager. At the time of his death he was commercial engineer to the American General Electric Co. Mr. Baylor was a member of the Institution of Electrical Engineers (Great Britain).

Financial Section.

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Results, Transactions in Stocks and Shares.

New Companies Registered.

F. C. Smith, Ltd.—Private company. Registered August 15th. Capital, £100 in 1s. shares. Objects: To acquire the business of experimental and constructional engineers now carried on at 3/4, Ham Yard, Great Windmill Street, W.1, as "A. W. Harris & N. H. Stubbs," and to acquire from A. W. Harris the whole of the rights contained in applications and provisional specifications numbered 22,607 to 22,611 (inclusive) for improvements in or relating to apparatus for driving gramophone records; means for regulating the speed of electric motors; loud speakers; and sound production. The directors are: A. W. Harris, 81, Brondesbury Villas, Kilburn, N.W.6, engineer; N. H. Stubbs, 110, Broadwater Road, Welwyn Garden City, Herts., accountant. Secretary: N. H. Stubbs. Registered office: 3/4, Ham Yard, Great Windmill Street, W.1.

Majestone, Ltd.—Private company. Registered August 19th. Capital, £1,250 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in apparatus used in connection with the production, operation, or display of kinematograph films or moving pictures, general and electrical engineers, electricians, proprietors, lessees or managers of theatres, music halls or kinematograph shows, &c. The subscribers (each with one share) are: P. I. Wiyoder, 80, Mosley Street, Manchester, dental surgeon; N. Marks, Leicester Avenue, Broughton Park, Manchester, manufacturer; G. Lodge, 221a, Roundhay Road, Leeds, engineer. P. I. Wiyoder signs documents as chairman. Solicitor: E. M. Redhead, 41, John Dalton Street, Manchester.

Steval Manufacturing Co., Ltd.—Private company. Registered August 16th. Capital, £5,000 in £1 shares. Objects: To carry on the business of letting on hire or sale or any system of hire-purchase all kinds of wireless apparatus and appliances, gramophones, musical and scientific instruments, manufacturers of and dealers in wireless apparatus, &c., and to acquire the trade mark "Steval." The subscribers (each with one share) are: B. Binford Hole, 65, Coleman Street, E.C.2, solicitor; J. B. Savel, 65, Coleman Street, E.C.2, solicitor's clerk. The first and permanent directors are: S. Ingram, A. Ingram and H. Elliott. Solicitors: Elwell & Binford Hole, 65, Coleman Street, E.C.2.

Official Returns of Electrical Companies.

Court Radio Co., Ltd.—Debenture dated July 4th, 1929, to secure £750, charged on the company's property, present and future, including uncalled capital. Holder: S. H. Baker, Eldon Street House, Eldon Street, E.C.

C. A. V. Small Tools, Ltd.—H. M. Morris, of Kennan's House, Crown Court, Cheapside, E.C.2, ceased to act as receiver or manager for first debenture holders on July 30th, 1929.

Stewart Thomson & Patrick, Ltd.—Particulars filed of £500 debentures authorised July 11th, 1929, charged on the company's undertaking and property, present and future, including unpaid capital, the whole amount being now issued.

Robt. F. Hearn, Ltd.—Particulars filed of £400 debentures authorised August 1st, 1929, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

Burlectas, Ltd.—Particulars filed of £2,000 debentures authorised June 5th, 1929, charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £500.

Borough Engineering Works, Ltd.—Particulars filed of £3,000 debentures authorised July 30th, 1929, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

W. G. Pearson & Sons, Ltd.—Capital, £6,000 in £1 shares. Return dated April 10th, 1929. All shares taken up. £6,000 considered as paid. Mortgages and charges, nil.

West Witton Electric Supply Co., Ltd.—Capital, £1,000 in £1 shares. Return dated March 16th, 1929. 885 shares taken up. £885 paid. Mortgages and charges, nil.

Clarke, Chapman & Co., Ltd.—Capital, £550,000 in 7,000 preference shares of £10 each and 480,000 ordinary shares of £1 each. Return dated March 8th, 1929. 6,985 preference and 440,060 ordinary shares taken up. £100,210 paid, being £10 per share on 4,435 preference shares and £1 per share on 55,360, and 5s. per share on 2,000 ordinary shares. £412,200 considered as paid on 389,250 shares, £1,500 considered as paid on 2,000 shares. Mortgages and charges, nil. A return of allotments dated July 5th, 1929, shows a further 12,500 shares allotted as fully paid.

H. J. Cash & Co., Ltd.—Capital, £25,000 in £1 shares. Return dated March 12th, 1929. 15,650 shares taken up. £10,650 paid on 10,650 shares. £5,000 considered as paid on 5,000 shares. Mortgages and charges, nil.

Carr & Childe, Ltd.—Capital, £2,000 in £1 shares. Return dated January 28th, 1929 (filed May 28th, 1929). 1,250 shares taken up. £750 paid on 750 shares. £500 considered as paid on 500 shares. Mortgages and charges, nil.

Bullphone, Ltd.—Debenture dated July 25th, 1929, to secure £3,000 charged on the company's undertaking and property, present and future, including uncalled capital. Holder: Mrs. Elsie G. Bullen, Whitehall, Chingford, Essex.

C. N. Vernon & Co., Ltd.—Particulars filed of £700 debentures authorised July 24th, 1929, and covered by trust deed, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

Mersey Electrics, Ltd.—Particular filed of £1,000 debentures authorised July 24th, 1929, charged on the company's undertaking and property, including uncalled capital and goodwill, the whole amount now being issued.

Illuminated Moving Signs, Ltd.—Particulars filed of £4,000 debentures authorised May 29th, 1929, charged on the company's property, present and future, including uncalled capital, the amount of the present issue being £1,900. (Registered August 6th, 1929, by permission of the Court.)

Winfield & Reeves, Ltd.—F. Holt, of 46-47, London Wall, E.C., ceased to act as receiver or manager on July 31st, 1929.

Hubert D. Carter, Ltd.—W. R. Redwood, of 74, Highgate Road, N.W.5, ceased to act as receiver or manager for first and second debenture holders on August 2nd, 1929.

Charles White Electrical Co., Ltd.—Capital, £3,000 in 2,000 "A" and 1,000 "B" shares of £1 each. Return dated February 22nd, 1928. 1,550 "A" and 1,000 "B" shares taken up. £1,050 paid on 1,000 "B" and 50 "A" shares. £1,500 considered as paid on 1,500 "A" shares. Mortgages and charges, nil.

Crossley Brothers, Ltd.—Capital, £1,492,293 in 403,390 preference shares of £1 each, 1,015,410 ordinary shares of 10s., and 581,196 preference or ordinary shares of £1. Return dated March 11th, 1929. 403,390 preference and 1,015,414 ordinary shares taken up. £405,700 paid on 278,200 preference and 255,000 ordinary shares. £505,397 considered as paid on 125,190 preference and 760,414 ordinary shares. Mortgages and charges, nil.

City of Buenos Aires Tramways Co. (1904), Ltd.—Capital, £1,240,000 in £5 shares. Return dated March 1st, 1929. All shares taken up and considered as fully paid. Mortgages and charges: £162,907.

Isle of Thanet Electric Supply Co., Ltd.—Capital, £500,000 in £1 shares (150,000 ordinary, 282,000 6 per cent. preference and 68,000 unissued). Return dated March 27th, 1929. 150,000 ordinary and 282,000 preference shares taken up. £222,000 paid on 222,000 preference shares. £210,000 considered as paid on 150,000 ordinary and 60,000 preference shares. Mortgages and charges: £286,788.

W. Skewes & Co., Ltd.—Capital, £1,000 in £1 shares. Return dated March 6th, 1929. 1,000 shares taken up. £650 paid on 650 shares. £350 considered as paid on 350 shares. Mortgages and charges, nil.

Electro-Plant, Ltd.—Capital, £1,000 in £1 shares. Return dated December 31st, 1928 (filed April 16th, 1929). Two shares taken up. £2 paid on two shares. Mortgages and charges, nil.

Power Securities Corporation, Ltd.—£2,000,000 in 1,000,000 preference and 1,000,000 ordinary shares of £1 each. Return dated March 6th, 1929. 500,000 preference and 500,000 ordinary shares taken up. £1,000,000 paid on 500,000 preference and 500,000 ordinary shares. Mortgages and charges, nil.

South Metropolitan Electric Tramways & Lighting Co., Ltd.—Capital, £500,000 in 300,000 ordinary and 200,000 preference shares of £1 each. Return dated March 12th, 1929. 250,000 ordinary and 200,000 preference shares taken up. £415,110 paid on 215,110 ordinary and 200,000 preference shares. £34,890 considered as paid on 34,890 ordinary shares. Mortgages and charges: £128,791.

Enterprise Manufacturing Co., Ltd.—P. Leask, 27/8, Finsbury Square, E.C.2, was appointed receiver on August 8th, 1929, under powers contained in debenture dated June 12th, 1923.

City Notes.

East African Power and Lighting Co., Ltd.

The report for 1928 shows a profit, including Sh. 30,966 brought forward, of Sh. 1,129,719, from which the following payments and appropriations have been made: Dividend for year on preference shares, Sh. 339,634; depreciation, Sh. 180,000; writing down expenses in connection with issues of capital and survey expenses, Sh. 705,805. There was, therefore, a balance of Sh. 423,914. It is proposed to pay a dividend on the ordinary shares at the rate of 6½ per cent. per annum, leaving Sh. 33,914 carried forward. Development of further hydro-electric works to augment the supply for the Nairobi area has been delayed by prolonged negotiations with the Government, which are still in progress, and the duplication of the main transmission line supplying Nairobi is nearing completion. The auxiliary oil-engine station at Nairobi is now in commission. Progress in Mombasa has been satisfactory, and considerable extensions to Kilindini Harbour are in hand. The fourth oil-engine set has been purchased and was put into commission in April. In November an issue of 30,000 ordinary shares of Sh. 20s. each was made at a premium of Sh. 8s. per share.

Compania de Electricidad del a Provincia de Buenos Aires.

The report for 1928 states that the electrical energy sold totalled 19,697,436 kWh, an increase of 1,905,291 kWh, and the number of consumers was 55,071, an increase of 6,948. The gross receipts were £571,111, and working expenses, including £40,000 as provision towards depreciation, administration expenses, &c., amounted to £338,365, leaving a working surplus of £232,746. After deducting general expenses, taxes in Europe, debenture interest, sinking fund for redemption of bonds, &c., there remains a net profit of £163,699, from which it is proposed to allocate £70,301 to reserve, £15,551

to directors, and to pay the preference dividend (£35,847). Sums paid as commission and other expenses in connection with the issue of the 200,000 new pre-preference shares, amounting to £22,014, have been written off by debiting them to the reserve account created.

Stock Exchange Notices.

Dealings in the following have been officially allowed by the Committee under Rule 159:—

Atlas Light and Power Company.—£4,162 five per cent. debenture stock.

Prussian Electric Company (Preussische Elektrizitäts-Aktiengesellschaft).—£200,000 six per cent. 25-year sterling bonds, Nos. A1,349 to A1,400 (£500), B3,261 to B5,000 (£100).

Shanghai Electric Construction Company.—15,002 shares of £1 each, fully paid, Nos. 553,149 to 568,150.

The undermentioned have been ordered to be officially quoted:—

Prussian Electric Co.—£1,200,000 six per cent. twenty-five year sterling bonds, Nos. A1 to A1,400 (£500) and B1 to B5,000 (£100).

Shanghai Electric Construction Co.—15,002 shares of £1 each, fully paid, Nos. 553,149 to 568,150.

Venezuela Central Railway Co., Ltd.

Presiding at the meeting of the company on August 19th, Mr. H. Langham Reed said that the accounts showed a further slight decrease in the company's gross and net revenue, due to the continued severe competition of the motor transport operating in the area served by the railway. To deal with this form of competition, a Diesel-electric service had been established to operate on the entire length of the line from Caracas to Ocumare. Trial runs had been made, and the announcement that a daily service had been established was expected shortly.

Eastern Telegraph Co., Ltd.

The Athens correspondent of a Frankfort newspaper reports that the negotiations between the Government of Greece and the Eastern Telegraph Company with regard to the prolongation of the company's concession have again been broken off, and the company's representative has left Athens. The reasons for this rupture are said to lie in the insurmountable difficulties with reference to the concessions to be made to Greece.

Bognor Gas and Electricity Co., Ltd.

Dividends at the rate of 8 per cent. per annum on original and additional ordinary consolidated stocks "A," 9 1/5 per cent. per annum on original ordinary consolidated stock "B," and 7 per cent. per annum on new consolidated stock, all less tax, have been declared.

Cuba Submarine Telegraph Co., Ltd.

The receipts for 1928 were £57,594, and expenses totalled £27,191, leaving a balance of £30,403, to which is added £10,170 brought forward, making £40,573. General reserve receives £20,000, and after payment of the preference dividends, there is a balance carried forward of £12,794.

Companies Struck off the Register.

The names of the undermentioned companies have been struck off the Register, and they are thereby dissolved:—

Cogent Electrical Co., Ltd.

Sun Power Co. (Eastern Hemisphere), Ltd.

Canadian General Electric Co., Ltd.

The directors have declared a quarterly dividend of 1¾ per cent. for the three months ending September 30th next, being at the rate of 7 per cent. per annum, on the preference stock.

Farnham Gas and Electricity Co., Ltd.

An interim dividend has been declared of 7½ per cent. per annum, less tax, on ordinary shares for the half-year, payable September 6th.

Radio Corporation of America, Inc.

A net profit of $4,996,487 is reported for the first six months of this year, as compared with $4,524,779 during the corresponding period last year.

Waste Heat and Gas Electrical Generating Stations, Ltd.

An interim dividend of 2½ per cent., less tax, has been declared on the share capital of the company for the half year ended July 31st last.

W. Canning & Co., Ltd.

An interim dividend at the rate of 5 per cent. per annum, less tax, has been declared.

Waygood-Otis, Ltd.

An interim dividend at the rate of 5 per cent. per annum, less tax, has been declared on the ordinary shares.

Pinchin, Johnson & Co., Ltd.

The directors have declared an interim dividend of 10 per cent. actual, less tax, on the ordinary shares.

Stocks and Shares.

MONDAY EVENING.

THE monetary situation, and the proceedings at the Hague Conference, both of which had been exerting a restraining effect upon Stock Exchange prices, manifested a disposition to change for the better towards the end of last week, with the result that Stock Exchange prices enjoyed a general recovery. The raising of the Federal Bank Rate in New York, which caused such a flurry a fortnight ago, has not been followed by any corresponding action on the part of the Bank of England. Instead, soothing reassurances have been given to the effect that the Bank Rate is not likely to be changed, at any rate during August, and that the dearness of money in America is no more than a domestic matter. The change-over from seriousness to strength was mentioned in last week's ELECTRICAL REVIEW, page 287, and prices have continued to improve in greater ratio than the volume of business has done. Holiday influences are at work to restrict the volume of trade, though these have little influence over the buoyancy of prices. It will be well understood that when so many people are away on holiday bent, it is easier for sharp fluctuations to occur than it is at normal times, when demand is more readily met by supply, and when both buying and selling are on a scale more considerable than that which prevails during August.

British Electric Traction.

With a further rise of 50 points, British Electric Traction deferred stock has mounted to 1,700. So far as can be seen, there is nothing to stop its going to 2,000, for very little stock comes to market, and there are always buyers for whatever is offered. The 6 per cent. cumulative participating preferred changed hands a few days ago at 126, the 8 per cent. preferred ordinary (quoted in our lists) at 126½, and the 5 per cent. perpetual debenture at 97½. The last-named carries half-yearly interest due next month. Torquay Tramways ordinary are 25s. ex the bonus of 6s. and interim dividend of 9 3/5d. net. Amongst Home Railways, a rise of 4 points in Underground Electric Railways income bonds has taken the price to 110. The £1 shares are also harder at 22s. 6d., and the Home Railway group, as a whole, makes a better showing than it has done of late. London United Tramways 4 per cent. debenture is 2 lower at 57. Metropolitan Electric Tramways 4½ per cent. debenture rose to 72.

Cables and Wireless.

One of the sections in which a slight improvement deserves to be noticed is that for Cables and Wireless stocks. The depression which occurred during the past two weeks has given place to a slightly more cheerful feeling. The "B" ordinary stock, which shed 5 points last week, going back to 75½, has recovered a trifle, although the price remains nominally unchanged. Investment continues to absorb the 5½ per cent. preference stock, which, as already mentioned here, is a sound security for those who are prepared to take what very slender risk is entailed through the purchase of stock in this commercial undertaking. It is impossible to work out precisely how the dividend on the 5½ per cent. preference stock is protected according to past earnings, the unknown factor being how much profit the Post Office made on its wireless and cable interests. But a conservative estimate can be made showing that the dividend on the preference stock should be covered rather more than twice over, according to the published earnings of the Cable Companies and Marconi's, adding thereto a reasonable sum for the probable Post Office profits, as to which no definite figures are available. The "A" ordinary stock is dull, at 85, because of an impression that the 7½ per cent. to which the stock is entitled may not be distributed in respect of the first year's working of the merger, a view that has been consistently maintained here. It is reasonable, however, to look for the 7½ per cent. being paid within the course of the next two or three years, so that, for the longer shot, the stock makes a sound holding for the speculative investor who is ready to wait for his reward in the shape of dividend and price-appreciation.

Marconi Percentages.

It is understood that, although the last day for making application is past, holders of Marconi shares can still exchange their interests for the relative Cables and Wireless stocks to which the scheme entitles them. There is, of course, no active market in the shares, although no doubt they could be sold, as shares, if anyone wished to save himself the trouble of carrying out the exchange. In all probability, however, the price offered for the £1 and the preference shares would be less than the market value of the Cables and Wireless equivalents, so that anyone who wishes to dispose of Marconi shares should make inquiries, first of all, as to whether it would not pay him to convert into the new stocks, and then sell, rather than to sell Marconis as such.

An interesting point that has not been settled in connection with the Marconi change-over is the percentage of shareholders who have assented to the plan. By comparing published figures with the amount of Cables and Wireless stock in which the Stock Exchange Committee has given permission to deal, it can be ascertained, by algebra, that the Marconi 10s. shares presented for conversion under the terms of the scheme is in the neighbourhood of 93 per cent. The proportion of £1 and preference shareholders—the two cannot be

separated for purposes of comparison—is a good deal lower, and something like 65 per cent. of shares would appear to be the proportion acquiescing in the plan. There lurks in the minds of a good many holders of Marconi £1 and preference shares a feeling that they have been treated none too well in the distribution of Cables and Wireless assets. Now that the heat and the dust of the controversy have subsided, the dispassionate observer may express academic wonder whether better treatment might not have been obtained had different methods been adopted to secure it.

Associated and General.

Associated Electrical Industries ordinary shares gave way to 2 3/16, apparently on profit-taking from America. The company is, of course, an amalgamation of Metropolitan-Vickers Electrical, Edison-Swan, British Thomson-Houston and Ferguson, Pailin. It is announced that the Edison-Swan will market the British Thomson-Houston products in connection with wiring supplies, lighting engineering, electric refrigeration and radio, together with Mazda radio valves, but not Mazda lamps. The statement aroused a good deal of interest, without affecting the price of Associated Electrical Industries' shares. Greater activity has been noticeable in General Electrics than in Associated. The former are back to 3 1/16. after their big rise of a week ago. British Aluminium are the firmest shares in their own particular group, and, at 2½, have gained half a crown.

Dollar Stocks.

The vehement excitement recently running so high in Hydro-Electric shares has given way to a calmer state of mind. The price subsided to 71, some 10 points below the best reached, but still 30 higher than ruled six weeks ago. A sharp rally lifted it again to 75. The stable-companion, International Holdings, is 12¾. Brazilian Tractions are unchanged at 74, after being down to 71; the 6 per cent. preference are 15 higher at 230. Mexico Tramways at 54 have gone back 3½, but Mexican Light and Power common once more attained the dignity of three figures, with a rise of 2½. Puebla Tramway Light and Power shares, mentioned as holding attraction as a gamble, are 2 to the good at 16½, and the company's 5 per cent. prior-lien bonds strengthened to 68. Montreal Light and Power gained 5½, with a rise to 143. International Telephone and Telegraph common shares are 7½ up, at 122½; American Telegraph and Telephone at 299 have risen 14 points.

Electricity Supply.

County of London, and Bournemouth and Poole have been in good demand, with resultant rises to 56s. and 67s. 6d. respectively. The latter are ex dividend, so that the gain on the week amounts to nearly 4s. Westminsters are ex the interim dividend of 8d., Metropolitans 7 1/5d., Northamptons 9 3/5d., all less tax. The last-named have advanced to 49s. 6d. Midland Counties followed up their last week's improvement with a further 1s. rise, making the price 34s. Amongst foreign issues, Whitehall Electric 7½ per cent. preference strengthened to 25s. Business in this department is quiet. Counties and Bournemouths are the two outstanding exceptions, there being a good deal of activity in both, expectation looking for a new issue from the County of London on terms that will provide a bonus. Egham and Staines put on a florin at 35s.; the new shares show an equal advance at 34s.

Ordinary Shares on Offer.

Amongst ordinary shares on offer in the market, it may be of service to mention 2,000 Altrincham Electric Supply deferred, of the nominal value of 1s., which are obtainable at 18s. 9d. These yield £7 16s. per cent. on the basis of the 1s. 5 4/7d. dividend paid in each of the last two years. The company's £1 ordinary shares stand at 57s., and pay 7¼ per cent. on the money. Atlas Light and Power at 28s. 6d. yield 3½ per cent., but it is thought that the dividend will be increased in the near future. Richmond (Surrey) ordinary shares are to be obtained at 46s. ex dividend, returning 4¾ per cent. on the 11 per cent. rate distributed last year. Electrical Finance and Securities ordinary shares at 42s. pay 4¾ per cent., the dividends for the past three years having been 10 per cent. per annum. There are 1,000 of these shares on offer, and, also, 500 Chiswick Electric Supply £1 shares at 60s. These give £5 6s. 6d. per cent. on the annual dividends lately declared of 16 per cent.

Miscellaneous Movements.

Globe Telegraph and Trust ordinary have dropped to 24½, which is well under the prices of Cables and Wireless, at which the old Eastern group of shares now stand. The yield on the money is £4 1s. 8d. per cent., tax free. Oriental Telephones have drooped to 3; on the other hand, Anglo-Portuguese Telephones at 24s. are 2s. higher. Amongst the manufacturing shares, Telegraph Constructions parted with 10s., falling to 23. Telephone Manufacturing are 4s., Hall's Telephone Accessories 15s. 9d., Ericsson Telephone 7 per cent. preference 20s. Ever-Ready ordinary firmed up to 21s. 9d. English Electric debenture at 70½ is a point better. The iron and steel group has received a decided accession of strength. Vickers went ahead to 10s. 4½d. Babcock & Wilcox put on 3s. 3d., to 65s. 9d., upon a moderate demand coming into a market poorly supplied with shares. The rubber group is dull, owing to depression in the price of the raw product.

Share List of Electrical Companies.

	Nom. £	Approx. Dividend. 1927.	1928.	Price Aug. 19 1929.	Rise or fall	Yield p.c.
Home Electricity Companies.						
Bournemouth and Poole	1	15	15	67/6xd	—$\frac{5}{16}$	4 9 8
Brompton Ordinary	1	8½	8½	26/-	—	5 7 8
Charing Cross Ordinary	1	8½	8½	26/-xd	—	5 7 8
do. do. 4½% Pref. ...	1	4½	4½	17/6xd	—	5 2 10
Chelsea	1	8¾	8¾	25/6	—	5 9 10
City of London	1	10	10	32/3	—	4 4 6
do. do. 6% Pref....	1	6	6	28/-	—	5 4 4
Clyde Valley	1	8	8	36/3	—	... ...
County of London	1	7½	10	56/-	+1/-	3 11 5
do. do. 6% Pref....	1	6	6	23/-	—	5 4 4
Edmundson's 7% Pref.	1	7	7	24/-	—	5 16 8
Elec. Supply Corporation	1	11	11	53/3	—	4 2 8
Kensington Ordinary	1	8	8	26/-	—	5 7 8
Lancs. Light and Power	1	7½	7½	28/-	—	5 7 2
London Electric	1	8½	9	28/-	—	5 0 0
Metropolitan	1	9	9	43/9xd	—	4 2 1
do. 4½% Pref.	1	4½	4½	17/6	—	5 2 10
Midland Counties	1	6½	6½	34/-	+1/-	3 16 6
Mid. Elec. Power	1	15	8	37/6	—	4 5 4
Newcastle-on-Tyne Ordinary ...	1	6	6	27/-	—	4 9 0
do. 7% Pref.	1	7	7	26/-	—	5 7 8
Notting Hill 6% Pref.	10	6	6	11	—	5 9 1
North Met. Elec. 6% Pref.	1	6	6	23/-	—	5 4 4
St. James' and Pall Mall	1	8	8	26/6	—	5 5 8
Scottish Power	1	8	8	30/-	—	5 6 8
South London	1	8½	8½	25/6	—	5 5 8
Urban Ordinary	1	7	—	37/-	—	... ...
Westminster Ordinary	1	8½	8½	25/6xd	—	5 9 10
Whitehall Elec. Invst. 7½% Pref. ...	1	7½	7½	25/-	+6d.	6 0
Yorkshire Elec.	1	8	8	36/-	—	4 9 0
Home Rails.						
Central London Ord. Assented ...	Stock	4	4	72	—	5 11 1
Metropolitan	,	8	8½	36xd	+1	6 5 0
do. District	,,	4	5	72½	—	6 18 0
Underground Electric	£1	5	7	22/6	+6d.	6 4 5
do. do. Income ...	Bonds	6	6	110	+4	5 9 9
Telegraphs and Telephones.						
Anglo-Am. Tel. Pref.	Stock	6	6	103	—	5 16 6
do. Def.	,,	1½	1½	24½	—	6 4 5
Automatic Telephone	1	10	12½	2	—	6 5 0
Cables & Wireless 5½ Pref.	Stock	—	—	95	+1	5 13 9
do. A 7½ Ord.	,,	—	—	85	—1	... ...
do. B Ord.	,,	—	—	75½	—	... ...
Globe Tel. and T. Ord.	10	10	10	24½	—1½	*4 1 8
do. do. Pref.	10	6	6	11	—½	5 9 1
Great Northern Tel.	10	20	17½	81	—	5 13 6
Indo-European	25	10	10	47½	—	*5 5 8
Marconi-Marine		12½	15	3$\frac{15}{16}$	—	4 10 8
Oriental Telephone Ord.		12	12	8	—$\frac{1}{16}$	... ...
Home and Foreign Trams, &c.						
Anglo-Arg. Trams First Pref. ...	5	5½	5½	3$\frac{7}{16}$	—	8 0 0
do. do. 2nd Pref. ...	5	6	6	3$\frac{7}{16}$	—$\frac{1}{16}$	8 14 6
do. do. 5% Deb. ...	Stock	5	5	74½	—	6 14 8
British Electric Traction Def. Ord.	,,	5	5	1700	+50	... ...
do. do. Pref. Ord.	,,	8	8	128	—	6 5 0
Brazil Traction	100	7	8	74	—	2 14 1
Brit. Columbia Elec. Rly. Pcs. ...	Stock	5	5	91½	—1	5 5 10
London & Sub. Trac. 5% Pref. ...	1	Nil	Nil	10/-	—	... ...
London United Tram Deb. ...	Stock	4	4	57	—2	7 0 4
Mexico Trams, 5% Bonds	—	5	5	75	—	6 12 9
Mexican Light Common	100	Nil	Nil	103	+2½	... ...
do. 7% Pref.	100	7	7	81½	—	8 11 10
do. 1st Bonds	—	5	5	78	—1	6 8 2
Yorkshire (West Riding)	1	Nil	Nil	5/-	—	... ...
Manufacturing Companies.						
Assoc. Elec. Ord.	1	6	—	2$\frac{7}{16}$	—$\frac{1}{16}$	2 15 0
Babcock & Wilcox	1	13	15	65/9	+3/3	*4 11 0
British Aluminium Ord.	1	10	10	2½	+½	*4 0 0
British Elec. Transformer Pref. ...	1	7	7	13/9	—	9 6 8
British Insulated Ord.	1	15	15	3¾	—	4 0 0
Brush Ord.	Stock	10	10	131	—	7 12 6
Callenders	1	15	15	3¾	—	4 0 0
do. 6½% Pref.	1	6½	6½	1¼	—	5 4 0
Crompton Parkinson Ord.	5/-	1	—	21/6	+6d.	... ...
do. 8% Pref.	1	8	—	25/-	—	6 5 5
Edison-Swan 1st Pref.	1	7½	7½	24/6	—	7 1 2
do. 5% Deb.	Stock	5	5	84½	—	5 18 4
Electric Construction	1	7½	6½	15/-	—	7 6 8
Enfield Cable Ord.	1	20	20	4¾	—	4 11 4
English Electric	1	Nil	Nil	6/3	—	... ...
do. do. Pref.	1	8	Nil	7/8	—	... ...
Gen. Elec. Pref.	1	6¾	6¾	24/-	—	5 8 4
do. Ord.	1	10	10	9$\frac{1}{16}$	—$\frac{1}{8}$	9 5 8
Henley	1	25	30	6¾	—	4 14 4
do. 4½% Pref.	5	4½	4½	4¾	—	5 6 8
India-Rubber	1	Nil	Nil	13/9	—	... ...
Johnson & Phillips	1	10	—	9	—	5 0 0
Siemens Ord.	1	7½	7½	30/-	—	5 0 0
Telegraph Construction	12	10*	10	23	—½	5 4 2

* Dividends paid free of Income Tax.

Our Foreign Electrical Trade.

Electrical Exports and Imports during July.

THE Board of Trade returns of our overseas trade during July show that the exports of electrical machinery, goods and apparatus reached a high level, the total being £319,564 above that of the previous month and £292,336 over the figure for July, 1928. The increase as compared with June was general; only three items showed a decline. Insulated wires and cables contributed about a third of the increase (£104,424), and thus became the highest individual item. A satisfactory rise occurred in the case of telegraph and telephone instruments and apparatus, while unenumerated goods, submarine telegraph and telephone cable, and batteries and accumulators also recorded good increases. The decreases were not of a serious nature, the largest (£5,995) occurring in the case of "other" motors and generators. The machinery section as a whole recorded an increase of £19,416. The comparison of the July figures with those of the corresponding month of 1928 also shows a substantial advance (£292,336). The items which were mainly responsible for this were telegraph and telephone instruments and apparatus (£100,749 increase) and insulated wires and cables (£84,273). There were also marked increases in the cases of unenumerated goods and apparatus, and telegraph and telephone cables (both submarine and non-submarine). The machinery section, on the other hand, manifested a decline (£30,303), due mainly to smaller exports of "other" motors and generators. Batteries and accumulators showed the only other decrease of any size (£10,642). The rise in the July total brought the figure for the first seven months of the year above that for the corresponding period of 1928. The total for the seven months is £11,060,903, against £10,788,489, an increase of £272,414.

Imports of electrical equipment were lower in July than in June, although they rose substantially above the July, 1928, level. The decrease was attributable principally to a decline in the imports of meters and instruments and telegraph and telephone instruments and apparatus. It will be noted, however, that both of these items were greater in value than in the corresponding month of last year. The only outstanding increase was shown for glow lamps; this probably marks the commencement of preparations for the winter lighting season. Three items stand out in the comparison with July, 1928; they are increases in the imports of unenumerated electrical goods and apparatus, telegraph and telephone apparatus, and batteries and accumulators. There was a decline of £12,005 in the machinery class. The total for the completed part of the year remained well above that for the corresponding period of last year, amounting to more than a month's supply.

The re-export section recorded increases in both comparisons, but the trade was still of small proportions.

We give below, as usual, an analysis of our electrical machinery exports during July, showing the principal markets and comparing the figures with those for July, 1928:—

Destination.	July, 1928. £	July, 1929. £	Inc. or dec. £
Europe	105,502	105,626	+ 224
Japan	13,629	22,041	+ 8,412
South America ...	59,966	53,163	- 6,803
South Africa	49,772	44,396	- 5,376
British India	118,548	110,439	- 8,109
Australia	96,195	56,413	-39,782
New Zealand	27,567	18,358	- 9,209
Canada	15,780	24,045	+ 8,265
Other countries ...	59,758	81,833	+22,075
Totals	£546,617	£516,314	-£30,303

It is worthy of note that, while the principal Dominion markets took smaller shares of the exports, Europe, Japan, and other countries increased their demand. Canada, too, showed a good improvement. The exports were almost exactly divided between Empire and foreign customers.

	Exports.			Imports.			Re-Exports.		
	Electrical exports for July, 1929.	Inc. or dec. as compared with June, 1929.	Inc. or dec. as compared with July, 1928.	Electrical imports for July, 1929.	Inc. or dec. as compared with June, 1929.	Inc. or dec. as compared with July, 1928.	Electrical re-exports for July, 1929.	Inc. or dec. as compared with June, 1929.	Inc. or dec. as compared with July, 1928.
Electrical goods and apparatus (unenumerated)	£279,019	+ £53,725	+ £60,825	£144,718	+ £7,966	+ £36,272	£8,746	+ £2,067	+ £1,929
Insulated wires and cables ...	318,321	+ 104,424	+ 84,273	76,044	+ 4,190	+ 5,242	639	+ 509	- 57
Glow lamps	59,957	+ 12,290	+ 17,500	34,227	+ 21,743	+ 745	3,521	+ 3,049	+ 2,787
Arc lamps and parts ...	5,342	+ 4,893	+ 3,969	865	- 219	- 1,942	7	- 217	- 1
Batteries and accumulators ...	87,689	+ 23,261	- 10,642	62,872	+ 7,081	+ 22,539	1,921	+ 453	+ 1,621
Meters and instruments ...	40,317	+ 9,706	+ 8,474	26,263	- 42,460	+ 691	129	- 736	- 766
Carbons	337	- 1,794	+ 70	10,222	- 4,040	+ 3,117	96	- 102	+ 10
Switchboards (not telegraph or telephone)	4,675	+ 1,859	- 1,159	—	— 239	- 3	—	—	—
Electrical Machinery—									
Electrical machinery (unenumerated)	312,712	+ 9,148	- 7,823	138,046	+ 1,141	- 12,005	9,616	- 3,400	- 1,711
Railway and tramway motors	33,224	+ 16,263	+ 7,701	—	—	—	—	—	—
Other motors and generators...	170,378	- 5,995	- 30,181	—	—	—	—	—	—
Telegraph and Telephone Cable and Material—									
Telegraph and telephone wires and cable (not submarine)	93,455	- 1,150	+ 34,615	5,002	+ 2,772	+ 3,014	1	+ 1	- 73
Submarine telegraph and telephone cable	32,176	+ 28,131	+ 23,965	—	—	—	—	—	—
Telegraph and telephone instruments and apparatus ...	265,714	+ 64,803	+ 100,749	90,810	- 31,014	+ 45,994	8,018	+ 1,411	+ 5,478
Totals	£1,703,316	+ £319,564	+ £292,336	£589,069	- £33,079	+ £103,464	£32,694	+ £3,035	+ £9,217
	Exports			Imports			Re-Exports		
Inc. for seven months	+ £272,414			+ £601,065			+ £4,615		

The Electrical Trade of Austria.

Figures for 1927 and 1928 Compared.

THE following tables give particulars of Austria's imports and exports of electrical machinery and apparatus in 1928, the total values in schillings (34½ schilling=£1), together with the total weights in quintals and the weights by countries of origin or destination, except in the case of lamps where the figures are in thousands instead of weights. Comparative figures for 1927 are given, where available, for purposes of comparison, and notes are added of increases or decreases :—

Imports.

	1927.	1928.	Inc. or dec.
Dynamos and motors (except for motor cars)—			
Value in 1000 schilling ...	5,056	7,503	+ 2,447
Number	31,300	41,560	+10,260
Weight in quintals	6,147	9,141	+ 2,994
From Germany	4,187	5,929	+ 1,742
,, Hungary	890	1,330	+ 440
,, Great Britain	80	230	+ 150
,, Switzerland	496	900	+ 404
Parts of ditto—			
Value in 1,000 schilling ...	565	741	+ 176
Weight in quintals	1,991	2,810	+ 819
Dynamos and motors connected with mechanical plant—			
Value in 1,000 schilling ...	2,927	3,783	+ 856
Number	20,271	27,022	+ 6,751
Weight in quintals	1,721	2,418	+ 697
From Germany	1,594	2,319	+ 725
,, Czecho-Slovakia ...	8	15	+ 7
,, Switzerland	10	15	+ 5
,, Sweden	66	8	− 58
Stationary transformers—			
Value in 1,000 schilling ...	966	2,110	+ 1,144
Number	3,864	5,910	+ 2,046
Weight in quintals	1,539	3,377	+ 1,838
From Germany	912	1,670	+ 758
,, Switzerland	528	1,560	+ 1,032
,, Hungary	39	75	+ 36
Rotary transformers—			
Value in 1,000 schilling ...	33	41	+ 8
Number	152	88	− 64
Weight in quintals	35	43	+ 8
From Switzerland	2	10	+ 8
,, Hungary	1	1	—
,, Germany	—	32	+ 32
Telegraph apparatus—*			
Value in 1,000 schilling ...	91	25	− 66
Weight in quintals	27	4	− 23
Telephone apparatus—*			
Value in 1,000 schilling ...	2,824	4,080	+ 1,256
Weight in quintals	673	1,310	+ 637
Radio apparatus—			
Value in 1,000 schilling ...	2,101	4,203	+ 2,102
Weight in quintals	326	764	+ 438
From Germany	151	360	+ 209
,, Great Britain	37	34	− 3
,, Holland	—	325	+ 325
Röntgen and electro-medical apparatus—*			
Value in 1,000 schilling ...	958	1,420	+ 462
Weight in quintals	481	930	+ 449
Electricity meters and measuring apparatus—			
Value in 1,000 schilling ...	2,132	2,730	+ 598
Weight in quintals	909	1,100	+ 191
From Germany	701	800	+ 99
,, Switzerland	159	260	+ 101
,, Czecho-Slovakia ...	7	8	+ 1
,, Hungary	23	30	+ 7
Incandescent lamps—			
Value in 1,000 schilling ...	3,016	2,980	− 36
Thousands	2,497	2,320	− 177
From Germany	1,676	1,885	+ 209
,, Hungary	250	45	− 205
,, Switzerland	—	317	+ 317
Heating and cooking apparatus and electric irons—			
Value in 1,000 schilling ...	332	480	+ 148
Weight in quintals	330	770	+ 440
From Germany	236	730	+ 494
Insulating tubes—*			
Value in 1,000 schilling ...	249	570	+ 321
Weight in quintals	1,578	3,500	+ 1,922
Other electrical apparatus—			
Value in 1,000 schilling ...	10,501	1,015	− 9,486
Weight in quintals	8,961	8,635	− 326
From Germany	7,332	7,210	− 122
,, Italy	12	7	− 5
,, Switzerland	790	640	− 150
,, Czecho-Slovakia ...	272	310	+ 38
,, Hungary	337	225	− 112
Lead-covered cable—			
Value in 1,000 schilling ...	22	52	+ 30
Weight in quintals	71	176	+ 105
From Sweden	23	26	+ 3
,, Germany	42	144	+ 102
Other cables and insulated wire—			
Value in 1,000 schilling ...	599	980	+ 381
Weight in quintals	623	1,280	+ 657
From Germany	199	640	+ 441
,, Italy	5	25	+ 20
,, Switzerland	134	250	+ 116
,, Czecho-Slovakia ...	232	260	+ 28
Accumulators and plates—			
Value in 1,000 schilling ...	195	330	+ 135
Weight in quintals	368	500	+ 132
From Germany	272	250	− 22
,, Sweden	37	160	+ 123

* Mainly from Germany.

Exports.

	1927.	1928.	Inc. or dec.
Dynamos and motors—			
Value in 1,000 schilling ...	7,631	8,440	+ 809
Number	16,976	17,500	+ 524
Weight in quintals	18,762	18,380	− 382
To Bulgaria	506	710	+ 204
,, Germany	1,713	2,150	+ 437
,, Italy	1,045	650	− 395
,, Poland	1,235	2,890	+ 1,655
,, Rumania	2,641	2,660	+ 19
,, Jugo-Slavia	2,400	2,350	− 50
,, Czecho-Slovakia	2,293	2,160	− 133
,, Hungary	1,850	820	− 1,030
Parts of ditto—			
Value in 1,000 schilling ...	681	940	+ 259
Weight in quintals	1,647	1,770	+ 123
Dynamos and motors connected with mechanical plant—			
Value in 1,000 schilling ...	732	1,220	+ 488
Weight in quintals	376	530	+ 154
Number	5,777	14,370	+ 8,593
To Great Britain	108	100	− 8
,, Jugo-Slavia	15	16	+ 1
,, Czecho-Slovakia	103	170	+ 67
,, Russia	2	30	+ 28
,, Poland	27	35	+ 8
Stationary transformers—			
Value in 1,000 schilling ...	1,677	3,670	+ 1,993
Number	13,301	12,080	− 1,221
Weight in quintals	4,255	8,820	+ 4,565
To Germany	646	840	+ 194
,, Italy	345	150	− 195
,, Poland	260	3,200	+ 2,940
,, Rumania	664	1,240	+ 576
,, Jugo-Slavia	744	1,080	+ 336
,, Czecho-Slovakia	293	280	− 13
,, Russia	302	480	+ 178
Telegraph apparatus—			
Value in 1,000 schilling ...	94	124	+ 30
Weight in quintals	28	32	+ 4
To Poland	17	18	+ 1
,, Rumania	8	—	− 8
,, Jugo-Slavia	2	—	− 2
,, Turkey	—	8	+ 8
Telephone apparatus—			
Value in 1,000 schilling ...	6,202	3,800	− 2,402
Weight in quintals	1,429	1,400	− 29
To Germany	56	115	+ 59
,, Great Britain	7	5	− 2
,, Italy	306	270	− 36
,, Czecho-Slovakia	659	175	− 484
,, Netherlands	3	130	+ 127
,, China	3	60	+ 57
,, Turkey	99	80	− 19
Radio apparatus—			
Value in 1,000 schilling ...	6,179	7,520	+ 1,341
Weight in quintals	1,161	2,000	+ 839

	1927.	1928.	Inc. or dec.
To Belgium	18	23	+ 5
,, Germany	171	345	+ 174
,, Great Britain	211	495	+ 284
,, Italy	63	90	+ 27
,, Czecho-Slovakia	120	170	+ 50
,, Poland	141	170	+ 29
,, Hungary	†	105	—
Electricity meters and measuring apparatus—			
Value in 1,000 schilling	1,570	1,970	+ 400
Weight in quintals	880	1,010	+ 130
To Germany	23	46	+ 23
,, Italy	10	6	− 4
,, Portugal	21	—	− 21
,, Jugo-Slavia	30	17	− 13
,, Czecho-Slovakia	37	56	+ 19
,, Hungary	59	45	− 14
,, Great Britain	143	170	+ 27
Incandescent lamps—			
Value in 1,000 schilling	21,039	22,920	+ 1,881
Thousands	18,660	19,920	+ 1,260
To German Free Ports	2,567	1,930	− 637
,, Germany	2,471	2,340	− 131
,, Great Britain	2,324	3,052	+ 728
,, Italy	1,556	1,970	+ 414
,, Czecho-Slovakia	925	1,330	+ 405
,, India	438	460	+ 22
,, Egypt	262	405	+ 143
,, United States	2,916	2,580	− 336
,, Mexico	†	232	—
,, Chile	†	320	—
Heating and cooking apparatus and electric irons—			
Value in 1,000 schilling	502	650	+ 148
Weight in quintals	648	910	+ 262
To Germany	44	40	− 4
,, Italy	32	40	+ 8
,, Jugo-Slavia	102	100	− 2
,, Hungary	67	40	− 27
,, Rumania	66	150	+ 84
,, Russia	100	30	− 70
Insulating tubes—			
Value in 1,000 schilling	314	330	+ 16
Weight in quintals	2,126	2,090	− 36

	1927.	1928.	Inc. or dec.
Other electrical apparatus—			
Value in 1,000 schilling	6,904	10,600	+ 3,696
Weight in quintals	10,340	15,800	+ 5,460
To Germany	865	1,300	+ 435
,, Italy	194	220	+ 26
,, Poland	678	2,800	+ 2,122
,, Rumania	999	1,300	+ 301
,, Switzerland	168	170	+ 2
,, Jugo-Slavia	1,469	1,500	+ 31
,, Czecho-Slovakia	1,057	1,300	+ 243
,, Hungary	921	1,050	+ 129
,, Great Britain	1,610	2,220	+ 610
Röntgen and electro-medical apparatus—			
Value in 1,000 schilling	1,452	1,370	− 82
Weight in quintals	887	760	− 127
To Germany	249	90	− 159
,, Rumania	158	140	− 18
,, Jugo-Slavia	96	120	+ 24
,, Czecho-Slovakia	80	50	− 30
Lead-covered cable—			
Value in 1,000 schilling	1,930	1,720	− 210
Weight in quintals	10,400	9,350	− 1,050
To Belgium	207	—	− 207
,, Bulgaria	255	220	− 35
,, Poland	3,584	1,350	− 2,234
,, Rumania	1,442	3,720	+ 2,278
,, Jugo-Slavia	4,049	2,050	− 1,999
Other cables and insulated wires—			
Value in 1,000 schilling	2,477	2,360	− 117
Weight in quintals	4,958	4,440	− 518
To Great Britain	347	11	− 336
,, Poland	740	670	− 70
,, Rumania	694	430	− 264
,, Jugo-Slavia	387	240	− 147
,, Czecho-Slovakia	334	440	+ 106
,, Mexico	399	—	− 399
Accumulators and plates—			
Value in 1,000 schilling	650	680	+ 30
Weight in quintals	1,707	2,070	+ 363
To Jugo-Slavia	831	1,070	+ 239

† Not specified.

Marketing a New Product.

The manufacturer, in putting a new line on the market, must decide which is the best course to take: to appeal to the wholesaler or go direct to the retailer.

(COMMUNICATED.)

IN placing a new line on the market the manufacturer generally finds that it takes a very long time to get the line even fairly well established. He may spend a large amount of money on advertising, his travellers will often call on the wholesale houses, and yet the results may be quite unsatisfactory. It may be found that the time and money is spent to obtain only a moderate trade.

The reason for the poor reception which a new article often receives from the wholesale trade is that it will compete with old-established lines, the names of which are practically household words. The buyers of wholesale houses do not want to be coaxed by eloquent representatives to buy new lines that are not well known, neither have they time to spend listening to the virtues and merits of these new lines. Although the profit on the old-established and well-advertised article may not be so good as the profit on a new line, the argument is that the buyer feels more secure in purchasing the old-established line, and considers it better stock.

Placed in this position, the manufacturer wonders what he can do for the best. He might say: "All right, if the wholesaler will not give me his support, I will go direct to the retailer." To the manufacturer with a limited capital such an action would be, to say the least, very risky. Instead of doing business with a few wholesale houses and securing regular payments each month, he would have to open hundreds of small accounts, run the risk of incurring bad debts, and his expenses in collecting these accounts would be considerable. This means that he would need a bigger office staff, and a packing department to handle the hundreds of small parcels, while there would be increased charges for carriage and postal expenses. In addition to these, the office staff would have to deal direct with each retailer in matters relating to damage in transit, shortages, &c. This class of work is very unremunerative, and it would appear that the best course to adopt would be to deal through the wholesaler, even if his hand has to be forced.

The small manufacturer will undoubtedly be in a safer and stronger position by going to the wholesale houses. If the wholesaler will not take up a manufacturer's goods, the manufacturer must create a demand—a demand by the retailer that he requires these goods, and if the wholesaler is unable to supply him, he must go to the wholesale house that can.

I have in mind the case of a manufacturer who turned out an excellent article that competed with any similarly priced line on the market. When this manufacturer's travellers called upon the wholesalers they found that many of them would not even consider the line. The buyer of one large wholesale house said: "We have carried Jones & Co.'s goods for many years, and we have no desire to change. Further," he added, "Jones & Co. spend many thousands of pounds annually on advertising, and their line is so well known and kept so well before the public through the Press, that it requires very little effort on our part to sell their goods." Another buyer of a large firm of wholesalers said: "Your article most certainly appeals to me; in fact, I am inclined to say that it is even better than the one we are already handling, but we must sell what the retailer demands. It does not follow that because a certain line is mostly in demand that it is the best, but we must satisfy the demand if we want to remain in business."

This manufacturer found that during the first six months his travellers were on the road very little headway was made. He called a meeting of his representatives, and the position was carefully examined, each traveller giving his view of the best course to take in finding a market for the line. It was decided that advertising on a large scale was entirely out of the question, and many of the travellers said that it would be a difficult matter to "get in" with the wholesale houses, in view of the fact that they preferred to stay with the old-established firms whose lines they had been running for many years.

After some discussion it was decided that a number of representatives should cover the ground, calling only upon retailers, and that they should endeavour to convince the retailers that this particular line was as good and probably better than the old-fashioned make. The object was not to sell to

the retail trade, but to obtain orders and ask for the names of the wholesalers through which they would like the goods sent. The representative informed the retailer that it would not put him (the retailer) to any trouble, as the firm would see that the order was sent to the wholesale house named. Each traveller was supplied with the usual book of order forms, and when he obtained an order he filled in the retailer's requirements, gave the name of the wholesale house, and obtained the signature of the retailer.

As the orders were received the traveller sent them to his firm, giving a report in each case, stating what other line the retailer was running in competition with his firm's manufactures. When the head office received these orders they were sorted out and sent to the wholesalers named therein, accompanied by a letter to the effect that the retailer would like delivery of these goods in his next parcel. It was further stated that "these goods will be sent to you carriage paid, and invoiced less the usual discount to wholesalers."

By taking this course the manufacturer was really forcing the hand of the wholesalers, while at the same time the orders passed to them were firm orders which had not cost them either time or money to obtain. The wholesaler who received a request from a retailer to supply him with certain goods which he had not in stock could not very well refuse to supply. If he told his customer that he did not keep these goods, it would be quite a simple matter for another wholesaler to supply, and he would know this only too well. He would also know that if he declined to supply the goods, the retailer would possibly give his other business to the wholesaler who did.

This manufacturer's representatives continued to send their orders to the head office, which were in turn sent to the respective wholesalers who executed them. The steady flow of orders for this particular line could not help being noticed by the wholesalers, but what the manufacturer really wanted to take place was that the retailers should send their repeat orders direct to the wholesaler. Once they did this, the wholesaler would be of opinion that it justified his stocking the line, which was the manufacturer's object. This really happened in this particular case, and before the end of 15 months most of the wholesalers of any note had taken up this new speciality.

Dirt-Track Lighting.

Particulars of the Installation at the Lea Bridge Speedway.

DIRT-track racing is, with very few exceptions, an evening sport dependent entirely upon artificial lighting. Its appeal to the public, the safety of the riders and, to a great extent, the quality of the racing itself vary in proportion to the nature of the illumination. High-intensity lighting, of course, is essential, and it is important for all

Fig. 1.—Night View of Lea Bridge Track.

parts of the track to be evenly lighted to avoid contrasts and deep shadows. Moreover, the lighting must be free from glare, and there must be no question of the riders being dazed by the lights they are approaching. As in horse racing, the riders wear distinguishing colours, which must be easily discernible from any part of the stands, and the lighting units must be arranged so that they do not cause visual discomfort to the spectators. For these reasons, expert knowledge, both of the special requirements and of modern lighting methods, are essential to the proper lighting of a dirt track.

One of the foremost examples in this country of efficient and correctly designed speedway lighting is the installation at the Lea Bridge Track, London. The lighting of this speedway has been described by the public, the riders, and the Press as being the best in the country. Roger Frogley, Sprouts Elder, Frank Arthur, Colin Watson, and Max Gruskreutz are amongst the stars who say that Lea Bridge is the best lighted track on which they have ridden. The installation was planned by the lighting engineers of the British Thomson-Houston Co., Ltd. A general view of the track as it appears at night is given in fig. 1, and in fig. 2 is shown the general layout in daylight. The installation is divided into three sections: the track, stands, and general lighting (*i.e.*, car park, pay boxes, paddock, and so on).

The supply is three-phase, 240 V, a.c., and is taken from the mains of the Leyton Corporation and run to the control switchboard, which was also supplied by the B.T.-H. Co. Each section of the lighting mentioned above is equally balanced on the three-phases, and, in addition, the stand lighting is operated through automatic contactors. Remote control enables an official on the track to put out these lights at the commencement of each race. The units for lighting the track are suspended at a uniform height by means of a special catenary system, and, although no less than 66 units are employed in this section of the lighting, there are only 36 poles, 28 of which are on the inside of the track.

Fig. 2.—The Track in Daylight.

The B.T.-H. lighting units are similar to the "Mazda" dispersive metal reflectors. They are weatherproof, and are each provided with a 1,500-watt standard gasfilled lamp. In order to prevent the units swaying, due to wind pressure, they are held rigid by means of a special overhead steady wire. For the stand lighting, which is switched off during each race, and for most of the general lighting, similar units with either 1,000-W or 750-W gasfilled lamps are used. The total number of these units installed is about 130.

All the main cables and feeders to the different units are run underground, and as the whole of the equipment, including the poles, is painted white, the installation gives a very pleasing appearance to the track. The safety of the riders is provided for by a number of fittings with ruby red glasses placed round the inside of the track. These can be remotely operated by an official in the event of a rider falling, in order to warn the others of the danger. In fact, careful provision has been made for every conceivable eventuality, and the installation demonstrates positively that a well-planned artificial lighting scheme will produce conditions equally as good as, if not better than, those which are obtained in daylight, whether it is on a speedway or any other sports ground.

The wiring for the Lea Bridge Speedway installation was carried out by the Bective Electrical Co., Ltd., under the supervision of the B.T.-H. engineers.

Electrical Developments in France.

The Paris correspondent of the *Financial Times* states that Mr. J. H. Adam, in a recent issue of the *Revue d'Economie Politique*, gives some interesting figures, collated from official sources, regarding the present position of the electric lighting and power industries in France. More than half the country area of France, it is stated, is now in possession of electric lighting and power, and there is a rapidly growing tendency to utilise electricity in all forms of agriculture. Whereas in December, 1918, there were 11,000 communes or parishes in possession of electric light and power, there are now 20,907 communes electrified, or 55 per cent. of the whole of France. In the great French cities the advance in the consumption of electric power has been most striking. For Paris alone, during the previous twelvemonth the total number of subscribers to electric light and power increased by 9 per cent., and the consumption of electricity increased by 1 per cent. The four great companies, which supply the Paris district with its electric lighting and power, last year sold to the public 1,800 million kWh, representing a consumption of 1,400,000 tons of coal.

A Fire-alarm Installation.

A modern Beasley-Gamewell system has been provided in the Urban District of Merton and Morden.

THE Urban District of Merton and Morden, Surrey, has recently been equipped with up-to-date street fire-alarm boxes and associated fire-station equipment, in place of the obsolescent boxes previously in service, which necessitated,

Fig. 1.—Beasley-Gamewell Non-interfering Sector Box.

not only the breakage of a glass protecting panel, thus exposing the key, but also the subsequent unlocking of the box door, before an alarm could be given. The new boxes, which are of the Beasley-Gamewell non-interfering sector type, obviate the delay incidental to this process, the breakage of a glass bridge-piece immediately freeing a lever which, on being pulled down in accordance with the clear instructions on each box, sends in its code and both signals and records the alarm at the fire station, together with the number of the box.

When its lever is fully depressed the sector box, fig. 1, sends out four complete signals, each embodying the above essential information, and also provides that no mutilation of a fire call takes place when two or more boxes on the same loop are operated simultaneously.

The signalling mechanism of each box is protected by three separate and distinct casings, affording ample weather safeguards and excluding dust and dirt from the contact surfaces, which are of pure platinum and of ample cross-section. Each box is equipped with testing and earthing keys, and is adequately protected against lightning. A telephone jack for the use of firemen facilitates connection with a portable hand telephone, and permits conversation with the fire station.

The Beasley-Gamewell system operates on the closed-circuit principle, and is claimed to be positive and self-testing at all times. A small current is always flowing through the loop, controlling the alarm devices at the station. A line break at any point can be temporarily circumvented by operating a switch at the fire station, which enables the boxes on the broken loop to continue functioning until repairs can be effected. Similarly, in the case of an earthed line, the system remains unaffected and signals are received with normal speed and accuracy. Such faults are detected by daily routine tests, and may be remedied at any favourable opportunity.

When operated, a Beasley-Gamewell street fire-alarm box momentarily interrupts the normally closed circuit to the fire station a definite number of times, and in regular sequence, corresponding with the code number of the box from which the signal is sent. The effect at the fire station is threefold. An electro-mechanical gong responds with one stroke for each break in the circuit, and, simultaneously, a ¼-in. hole is punched in a travelling paper tape, permanently recording the signal; during the foregoing cycle a trembler alarm bell rings continuously.

The Merton installation embraces twenty of these boxes, connected in series on two loops, which terminate at the fire station on the switchboard shown in fig. 2. This switchboard is equipped with the necessary instruments, voltmeter, ammeters, switches, keys, &c., for controlling and testing the circuits, as well as for charging and changing over the storage batteries from which the system is operated. Provision is also made, by means of extension circuits and the A.T.M. firemen's call-bell system, to ring the box code in every fireman's house whenever an alarm is given. The lines connecting the street boxes with the fire station are leased from the post office.

The whole of the street boxes and fire-station equipment were manufactured to the order of the Merton and Morden Urban District Council by Automatic Telephone Manufacturing Co., Ltd.

It is of interest to note that the original installation, now displaced by that described above, was also a Beasley-Gamewell system, and comprised 14 street boxes with associated fire-station equipment, installed in October, 1909. This original equipment has thus functioned satisfactorily for 20 years before being replaced by modern and improved apparatus on the same principle.

Fig. 2.—Fire-alarm Equipment at Merton and Morden Station.

Electricity in Mines.

Annual Reports of the Secretary for Mines and H.M. Chief Inspector of Mines.

THE annual report of the Secretary for Mines and that of H.M. Chief Inspector of Mines (H.M. Stationery Office, 5s. 6d. net), for the year ended December 31st, 1928, have recently been issued.

The Secretary states that the results for 1928 were as disappointing as those for 1927, although some improvement was noticeable towards the end of the year. The amount of coal

raised (237½ million tons) was reduced by 5½ per cent., that exported (71½ million tons) was slightly less, and the number of men (938,988) employed in coal mines was less by 8½ per cent. The average selling price at the pit head decreased from 14s. 7d. per ton in 1927 to 12s. 10d. per ton in 1928.

Progress in mechanical equipment continued, and to-day 26 per cent. of the coal was cut by machines other than light pneumatic picks, as against 13 per cent. in 1913. In some Scottish districts the proportion was as high as 65 per cent. About 25 per cent. of the saleable coal raised was cleaned in the 585 washing and cleaning plants in operation. In fig. 1 the growth of electric horse-power installed for various purposes since 1913 is illustrated.

Although the number of coal mines in operation in 1928 was less by 11½ per cent. than in the preceding year, it will be seen by comparing the figures in Table I, with those for 1927 (Electrical Review, August 17th, 1928, p. 297), that the horse-power of electric motors in use was actually increased, the improvement being spread fairly evenly over all types of plant. For the first time the number of electrical coal cutters has exceeded the number operated by compressed air.

In Table II particulars are given of the amount of coal consumed by different industries in Great Britain in 1912 and 1928. It will be observed that the enormously increased use of electricity is reflected to a disproportionately small extent in the fuel consumption, while the quantity required for gas making, railway locomotives, and domestic uses has hardly varied in the 15 years under survey.

Testing work on safety lamps has been concerned chiefly with the question of increased candle-power and with electrical and other devices for detecting fire-damp.

A committee of inquiry was formed to consider whether the qualifications prescribed for officials are effectively adapted to the needs of the industry. As a commentary on the terms of reference to this committee, it may be noted that the Chief Inspector's report shows that during the year 1,014 persons were killed and 163,349 injured in all mines, above and below ground, the numbers due to electricity being, respectively, 12 and 48. Eight men were killed and nine injured in three explosions caused by electricity. These accidents, with possibly one exception (where an unsuitable type of switch was employed), were due to neglect in maintenance of the electrical equipment. During the last five years there have been 13 such accidents, resulting in 17 deaths and 52 injuries. Of five men killed by accidents on the surface in connection with the use of electricity, three were electricians, and the report states, these accidents would have been avoided by the exercise of a little forethought. The total death rate in metalliferous mines has fallen from 2.24 per 1,000 (7.42 per million tons raised) in 1873-82 (yearly average) to 1.04 per 1,000 (4.04 per million tons raised) in 1928. A large part of this proportionate reduction in fatalities is due to the very much smaller number of explosions due to fire-damp and coal dust in recent years. The annual average in the decade 1873-1882 was 263, as against 36 in 1928.

The report includes a copy of the circular letter sent out last year by the Secretary for Mines to responsible mines officials, setting out the essential principles in the design of electrical coal cutting machinery to guard against accidents through ignitions of fire-damp attributable to the use of electric power.

Falls of ground still continue to provide the commonest type of fatality, the number of fatal accidents from this cause not having altered appreciably in 55 years, though in proportion to the number of persons employed the reduction has been over 40 per cent.

Table I.

	England and Wales.	Scotland	Great Britain.
Total mines at work	2,094	445	2,539
Mines at which electrical equipment is installed ...	1,156	311	1,467
Number of electric motors in use	27,742	8,953	36,695
H.p. of motors in use :—			
Below ground—			
Haulage	312,850	61,750	374,600
Conveyors and loaders ...	10,139	8,131	18,270
Pumping	274,605	105,137	379,742
Coal-cutting machines ...	58,338	40,089	98,427
Other portable machines	1,597	1,548	3,145
Miscellaneous	17,213	6,263	23,476
Total	674,742	222,918	897,660
Above ground—			
Winding	137,768	11,212	148,980
Ventilation	105,310	9,766	115,076
Haulage	68,475	8,078	76,553
Washing or screening ...	129,584	19,129	148,713
Miscellaneous	314,667	20,683	335,350
Total	755,804	68,868	824,672
Grand Total	1,430,546	291,786	1,722,332

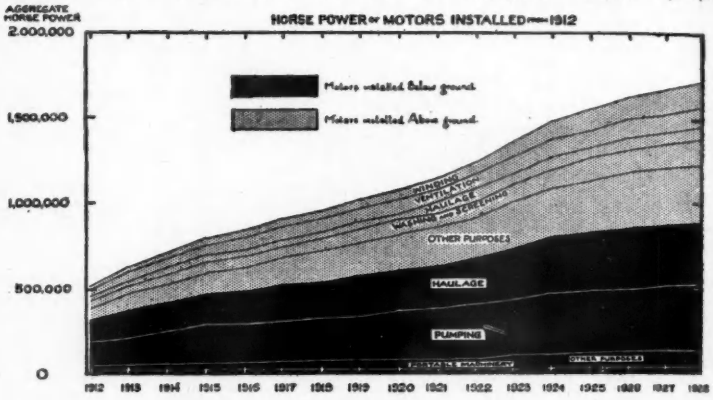


Fig. 1.—Horse-power of Motors Installed in Collieries 1912 to 1928.

Number of mines at which coal-cutting machines were in use	643	265	908
Number of machines—			
Disc	321	472	793
Bar	291	344	635
Chain	2,665	726	3,391
Percussive and others ...	2,250	62	2,312
Total	5,527	1,604	7,131
Number driven by—			
Electricity	2,063	1,523	3,586
Compressed air	3,464	81	3,545
Coal cut by machines (tons)...	42,327,428	19,060,704	61,388,132
Percentage of total output cut by machines	21	59	26
Number of conveyors at coal face—			
Electric	452	440	892
Compressed air	1,288	23	1,311
Total	1,740	463	2,203

Table II.

Consumer.	1913 Millions of tons.	1913 Per cent. of total.	1928 Millions of tons.	1928 Per cent. of total.
1. Electricity generating stations of authorised undertakers, tramways, and railways	4.9	2.7	9.51	5.8
2. Gas works	16.7	9.1	16.83	10.3
3. Railway locomotives ...	13.2	7.2	13.05	8.0
4. Coasting boats	1.9	1.0	1.24	0.8
5. Pig iron	21.2	11.5	12.13	7.4
6. Other iron and steel works	10.2	5.5	8.50	5.2
7. Colliery engines	18.0	9.8	13.50	8.2
8. Domestic (incl. miners' coal)	40.0	21.8	40.00	24.4
9. General manufacturers and miscellaneous ...	57.7	31.4	49.10	29.9
	183.8	100.0	163.86	100.0

Small Standard Power Houses.

The Metropolitan-Vickers Electrical Co., Ltd., is producing complete generating stations in six sizes from 330 to 3,750 kW.

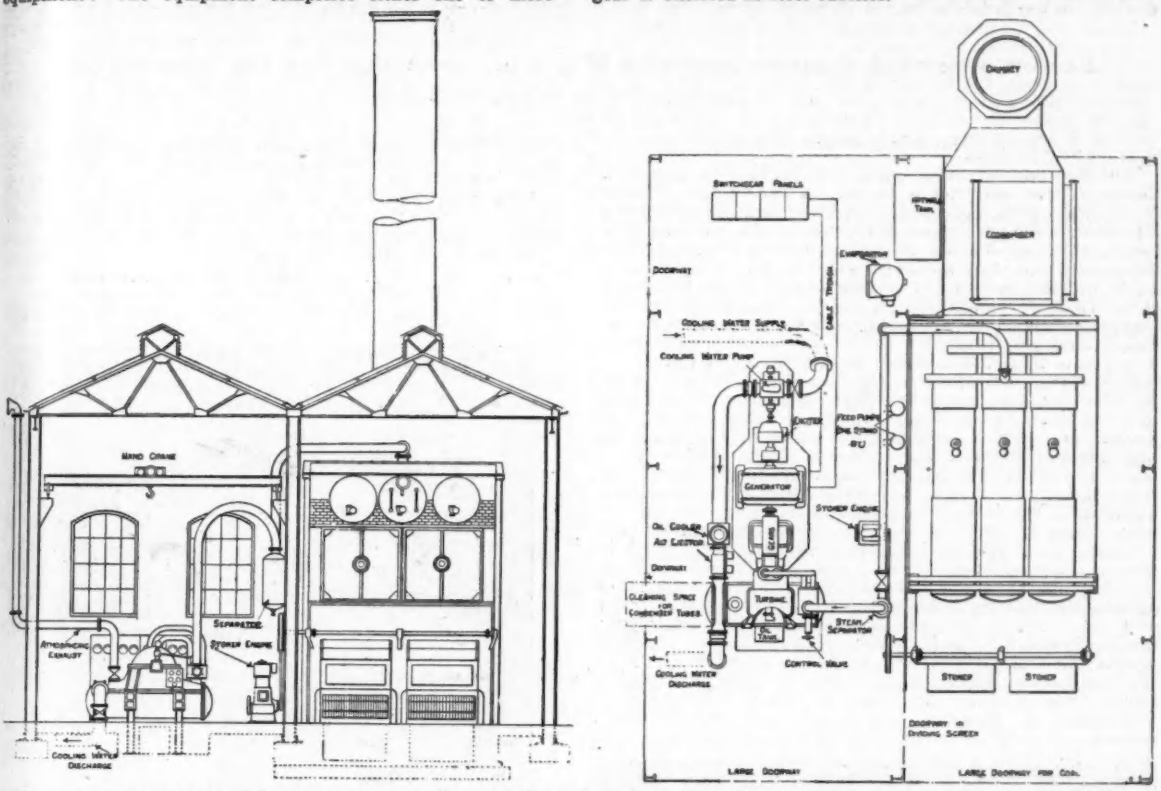
TO meet the requirements of those who want electric power provided at a low cost, with little trouble and in a small space, the Metropolitan-Vickers Electrical Co., Ltd., has standardised a series of complete power stations of capacities from 330 kW to 3,750 kW, and undertakes the erection of these stations with their entire equipments ready for commercial service. In fuel economy these stations compare favourably, it is claimed, with the largest modern power stations, and they are extremely simple to operate.

The power houses are made in six standard sizes with maximum outputs of 330, 625, 1,250, 1,875, 2,500, and 3,750 kW. Three-phase alternating current at 50 periods has been adopted with standard voltages of 400 V for the 330 kW and 625 kW equipments, and 3,300 V for the larger plants. These voltages have been adopted in order to ensure the most economical all-round results in generation and distribution, enabling standard motors, &c., to be employed. Machines at other voltages or periodicities, or generating direct current, will be

supplied if required. A typical arrangement of a M.-V. standard power house, equipped with water-tube boilers, is shown in figs. 1 and 2.

The following notes are taken from the specification of the equipment:—The equipment comprises either one or more

Three distribution panels and a panel to control the generator, all of Metropolitan-Vickers manufacture, are supplied as standard with each size of power house. For 400 volts, open-type slate switchboards are supplied; for 3,300 volts the switchgear is enclosed in steel cubicles.



Figs. 1 and 2.—Typical General Arrangement of M.V. Standard Small Power House Equipped with Water-tube Boiler; End Elevation and Plan.

Lancashire boilers, or, alternatively, a water-tube boiler or boilers, according to requirements. Either type of boiler will be provided, if required, with mechanical stokers driven by a small auxiliary steam engine. The boilers are supplied complete in all cases with economiser, superheater, two feed pumps (one as standby), steel chimney stack, and all other accessories except brickwork (which is more cheaply obtained locally). A Metropolitan-Vickers self-contained turbo set is employed as the generating unit in standard power houses. In each case this comprises a highly efficient high-speed turbine driving, not

The standard building is of the steel-framed type, covered with Robertson's asbestos-protected metal sheeting. The building houses both the generating plant and the boiler equipment, and is suitably wired for electric lighting. The preparation of suitable building foundations, up to floor level, is preferably carried out by purchasers, but the company will supply drawings giving full particulars of the foundations necessary upon receipt of information regarding subsoil conditions. The weights to be carried are small and uniformly distributed, and require only comparatively light foundations.

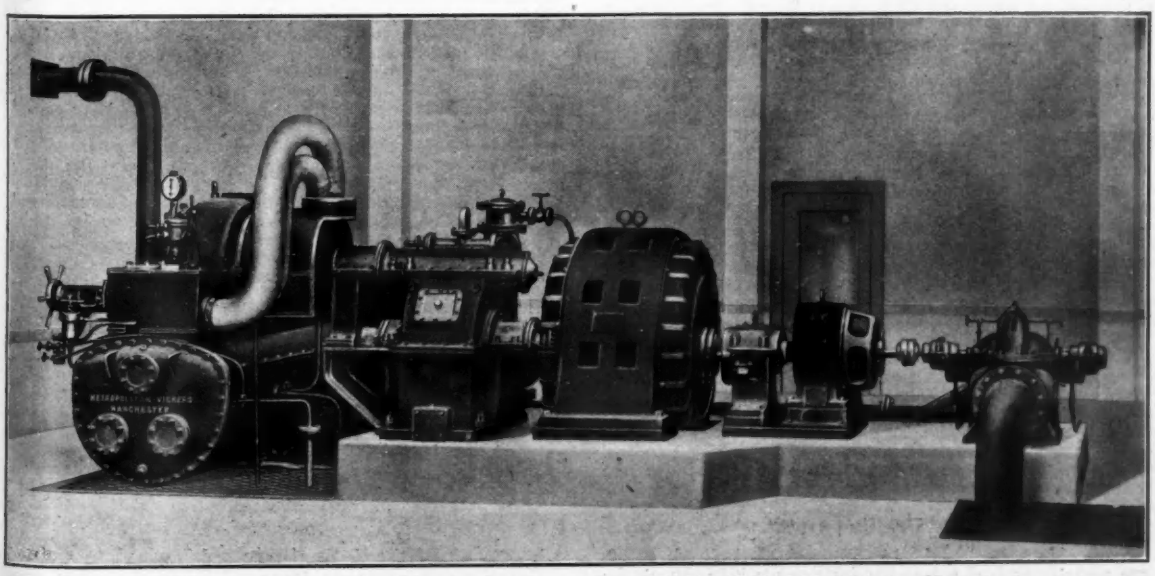


Fig. 3.—Self-contained Turbo Set as employed in Small Standard Power Houses.

only the generator, but also the condenser circulating-water pump and the condensate extraction pump—thus facilitating quick and easy starting. If no river or other natural supply of water is available, a spray cooler or a wooden natural-draught tower is provided for cooling the circulating water.

A hand-operated travelling crane is provided above the generator set, an evaporator is provided to make up the loss of feed water, and a complete set of tools, together with suitable spares, is also included. Fig. 3 shows a M.V. self-contained turbo set.

New Electrical Devices, Fittings, and Plant.

Readers are invited to submit particulars of new or improved devices and apparatus for publication in this section.

A Thermo-Electric Surface Pyrometer.

The accompanying illustration, fig. 1, shows the P.B. thermo-electric surface pyrometer, a production of the Drayton Regulator & Instrument Co., Ltd., West Drayton, Middlesex. The thermo-couple is made up of metal strip, approximately one-hundredth of an inch thick and .2 in. wide, which is held taut by a spring. The two halves of this strip are of different metals and are securely joined in the centre at B. Thus, if the strip is laid on the surface of which the temperature is to be measured, this temperature is immediately indicated on the dial by the deflection of the pointer. A bridge of insulating material is supplied which can be inserted between the thermo-couple strip and the tension spring for measuring the temperature of flat surfaces. The temperature can be read immediately the thermo-couple is applied to the surface. On this account, and owing to the extremely small mass of the metal strip, the loss of heat resulting from the measurement is exceedingly small. An instrument of this kind will not give an accurate reading under all circumstances, unless some provision is made for maintaining constant the temperature of the ends of the strip remote from the hot junction. This provision is essential, as the current which is generated depends, not only upon the temperature of the hot junction, but upon the difference between this temperature and the temperature of the other two ends, which are known as the "cold junction." It is thus evident that it is only possible to calibrate the instrument correctly for one temperature of the cold junction, and unless the cold junction is at this temperature when the instrument is used, the reading cannot possibly be accurate. In order to overcome this difficulty, the cold junction is incorporated in the handle of the apparatus at A, in such a way that it comes into contact with

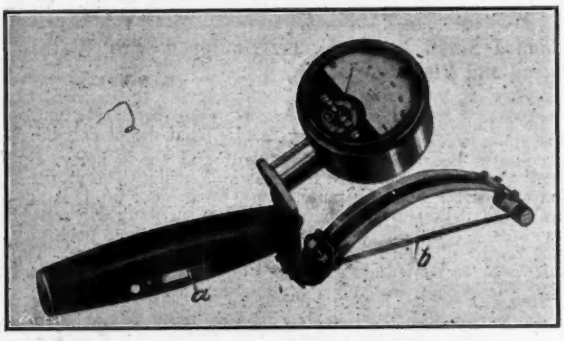


Fig. 1.—P.B. Thermo-electric Pyrometer.

the palm of the hand when in use. Experience has shown this temperature to be extraordinarily constant, the cold junction being heated very rapidly to a temperature about 11 deg. F. below that of the human body, even when the user has what is known as a "cold hand." The zero position of the pointer is therefore 86 deg. F., but a suitably calibrated instrument can be employed for measuring any desired temperature below this, the pointer being deflected to the left. The apparatus is accurate to within two to three degrees, even with the smallest temperature range of only 214 deg. F. The standard scale for instruments having this range is from 86 deg. to 300 deg. F. Other temperature limits can be arranged as required however:—20 deg. to +195 deg. F. for example.

Where necessary, the standard apparatus can be supplied for measuring very much higher temperatures, up to about 1,400 deg. F., but in such cases it is advisable to employ the modified form in which the hot junction is fitted at the end of a rod, so that the instrument itself and the hand of the user do not have to be brought too near the hot surface. Further, a special instrument has been developed for the measurement of temperatures up to 1,800 deg. and even 2,250 deg. F.

A New Drafting Outfit.

Messrs. Saunders Bros., 14, Kidbrook Park Road, S.E.3, have recently evolved a portable drafting machine, fig. 2, the universal application of which will be appreciated by the practical engineer or surveyor. The "Kompakt" takes the form of a light, special metal plate with a raised edge to which is permanently attached a spring-loaded tee square, free to slide, but always in rigid contact with the metal edge. It may be used with a 100-copy triplicate sketch book, when the plate is inserted by the left hand; at the same time the square is tilted by the thumb, the pages with carbon previously inserted being passed under the square with the right hand. After insertion the pages are smoothed down with one hand and the grip A screwed down with the other, securely holding the pages to the "board." On the underside of the plate are two combined book stops and feet C and D, two adjustable combined stops and feet E and F, and a stop under grip A, which fit over the pages below, thus locating the "board" rigidly with the book. It may also be used with loose sheets of paper, when the "board" is placed on these stops or feet, and the

Fig. 2.—The "Kompakt" Drafting Machine.

two adjustable stops E and F, which are provided with shrouded needles, are screwed out; the two thumbs are pressed one on each of these stops and needles grip the table on which the machine stands. The loose sheets of paper are held by the grip A, and an additional adjustable grip B, which may be moved up and down the edge to suit sheets of paper from 13¼ in. by 9 in. down to 5 in. by 5 in. If the "board" is on any uneven surface it may be immediately levelled by further adjusting the stops E and F. Further, the machine may be used as a table for field work, by dropping the feet on the underside of the plate into recesses in the top of the case, thus fixing the machine rigidly to the case. There are no loose parts, and sharper and dead accurate drawings are produced, as no "packing" is required as with wooden boards, and compass needles grip in the special metal without marking it or boring holes in paper. If more than three copies of any sketch are required, prints may be made from the three originals in the sketch book. The complete outfit—machine, sketch book, scales, loose paper, instruments, set squares, and so on—are all contained in the case, which measures 14¼ in. by 11½ in. by 3½ in

A New Three-plate Ceiling Rose.

The two-plate semi-recessed type of ceiling rose, fig. 3, which has been marketed for some time by Messrs. Falk, Stadelmann & Co., Ltd., 83 to 93, Farringdon Road, E.C.1, has proved so useful that the company has now produced a

Fig. 3.—"Efesca" Semi-recessed Two-plate Ceiling Rose.

three-plate model of similar design. The rose is intended for direct mounting on circular conduit boxes, and is claimed to be the first three-plate rose for this purpose to be put on the market. It is of British manufacture throughout, and is fitted with substantial terminals for looping in.

Reflecting Radio Antennæ.

A theoretical discussion of the action of the currents produced in two tuned vertical receiving aerials.

By L. S. Palmer, M.I.E.E., and L. Ley K. Honeyball.

(*Extracts from Institution of Electrical Engineer's paper.*)*

Ever since Hertz demonstrated the similarity between wireless and light waves, the mode of reflection of the former has been a subject of considerable discussion and some difference of opinion. The advent of short-wave beam transmission has brought the question to the forefront in recent years, and various suggestions have been put forward in order to explain the experimental facts associated with wireless-wave reflection from the usual types of reflector consisting of grids of parallel vertical wires.

Many authorities assumed that the mechanism of reflection of wireless waves from wires was similar to the reflection of light waves from glass, leading to the conclusion that, upon reflection, there is a change of phase of the wave amounting to 180°.

However, there appears to be no obvious reason for comparing the reflection of wireless waves from copper wires with that of light waves from glass; had optical reflection from metals been considered, then the phase-change would not have been 180°.

In a series of papers published in 1926 and 1927, Uda showed that the phenomenon of the reflection, and the consequent field strength produced at any point, depended on the relative phases of the currents in the oscillator and in the reflectors, and that this phase relation was, in turn, a complicated function of the distances between the oscillator and the reflectors; furthermore, it depended upon their impedances. At about the same time Tatarinoff (in Russia) determined experimentally the phase difference between the currents in an oscillator and in a parallel tuner reflector wire, and he concluded that the forward radiation was a maximum when the distance between the oscillator and reflector was $1/5\lambda$; a less important maximum occurred when the distance was increased to about $\frac{3}{4}\lambda$, where λ is the wave-length.

In 1928 Wilmotte and McPetrie attacked the problem theoretically from a rather different point of view: they concluded that, for the fields to be in phase directly in front of an oscillator with a tuned reflector behind it, the distance of the reflector behind the oscillator must be 0.33λ. They also stated that, for the fields behind the reflector to be in opposite phase, the optimum distance between the reflector and the oscillator must be 0.16λ, but that this was not necessarily the condition for minimum resultant field; their results agree substantially with those of Tatarinoff.

Finally, in 1928, Gresky concluded that 0.20λ was the optimum distance between oscillator and reflector for maximum forward radiation.

Prior to these investigations it had usually been assumed that the optimum distance between oscillator and reflector was $\frac{1}{4}\lambda$, which conclusion is fallacious, because it is based upon considerations which neglect the mutual effects between the wires. At distances comparable with one wave-length the three "components" of an electromagnetic field may be of the same order of magnitude, and none can be neglected in a theoretical discussion. It has usually been considered sufficient to assume that the radiation component is much greater than the so-called induction and static components, such an assumption leading to the incorrect conclusion referred to above.

In the present paper the currents produced in two tuned vertical aerials, both acting as receivers in a radiation field, are discussed theoretically. Two special cases are considered in detail, *viz.*, (1) when the aerials are less than one wave-length apart and are in line with the transmitter ("end-on" position) and (2) when they are less than one wave-length apart and at right angles to the transmitter ("broadside-on" position).

In the first case, the current in the aerial nearer to the transmitter attains a maximum value when the distance D between the aerials is approximately 0.33λ, or 0.85λ, and is a minimum when D is approximately 0.60λ. The current in the aerial remote from the transmitter reaches a maximum value when D is 0.16λ, and then steadily decreases as the distance between the aerials increases to one wave-length.

For the "broadside-on" position, the current in each aerial attains a maximum when the distance between the aerials is 0.71λ.

The details of the design of the short-wave oscillator and receiving aerials employed are outlined, and the method of procedure in order to obtain the current measurements is described.

The experimental results obtained are compared with the theoretical calculations. The solutions of the general equation $\tan \alpha\ (1+\cos\beta)=(\alpha^2-1)/\alpha$ gives the critical values of the ratio of the distance between two tuned antennæ to the length of the wave, for which the antenna currents are a maximum or a minimum, the plane of the antennæ being at any angle β to the direction of propagation; $\alpha=2\pi D/\lambda$.

* Published in I.E.E. *Journal* No. 392, not read.

Correspondence.

Correspondents should forward their communications **as early as possible.** *No letter can be published unless we have the writer's name and address in our possession.*

Synchronous Motors.

With reference to the letter from "Non-Mathematician," I should like to say that vector analysis shows very clearly the effect of varying the excitation of a synchronous motor, but I agree with him that it does not give a physical explanation of the changes which take place, which are, to my mind, as follows:—

When a synchronous motor is running at unity power factor and the machine losses are neglected, the field current produces a flux which, in turn, produces an e.m.f. (known as the induced e.m.f.), equal in magnitude, but in direct phase opposition, to the applied e.m.f.

If the exciting current is increased, the exciting flux increases, but, as the induced e.m.f. cannot exceed its former value, current is taken from the mains to produce another flux, which neutralises the increase in excitation.

The second flux is purely demagnetising and is produced by a leading current, as will be appreciated on studying the effect of armature reaction, and, under the new conditions, the machine will take a leading current.

If the excitaion were decreased, a lagging or magnetising current would be taken and the machine would run at a lagging power factor.

G. Haynes.

Hebburn-on-Tyne,
August 10th, 1929.

May I, while reminding "Non-Mathematician" that vector analysis plays an important part in the simplification of a number of a.c. problems, offer the following solution to his problem? In what follows some of the statements may appear a trifle "loose," but that is what comes of attempting a simple explanation.

Consider any system of conductors cutting a magnetic field: an e.m.f. is induced. In a synchronous motor a back e.m.f. is induced when the armature conductors cut (or are cut by) the field produced by the d.c. excitation. That e.m.f. is proportional simply to the field strength, since the number of conductors, speed, &c., are constant. Hence, by making the excitation big enough, it is possible to have a back e.m.f. bigger than the supply voltage, or by reducing the excitation the back e.m.f. may be much smaller than the supply voltage.

Assuming that the excitation is such that the armature current and supply voltage are in phase, then for a motor having only armature resistance the supply voltage is equal to the back e.m.f., plus the armature resistance drop.

Consider now a choke coil in series with the motor. It will reduce the applied voltage at the motor terminals and therefore the back e.m.f. can be smaller (corresponding to reduced excitation). Transfer the choke coil to the machine, *i.e.*, let it be replaced by the inherent armature reactance, then only the smaller back e.m.f. is required to balance the supply voltage (note that, as we now have a fictitious choke in the circuit, the current is lagging).

Hence, at first sight, the only thing which is going to allow the back e.m.f. to be bigger than the supply voltage is the opposite of an internal choke, *i.e.*, an internal condenser. If, "Non-Mathematician" is prepared to agree that the supply voltages may be thought of as being made up of two fictitious components, then he can see that for an under-excited motor the supply voltage is used for balancing the back e.m.f., plus the armature drop, and also for the back e.m.f. for the internal choke. In the same way, for an over-excited synchronous motor the bigger back e.m.f. is used to balance the back e.m.f. of the internal condenser and the supply voltage, minus the armature drop. It is just as if the fictitious internal condenser were absorbing some of the back e.m.f., and the effective e.m.f. so reduced just differs from the supply voltage by an amount equal to the armature resistance drop.

Hence over-excitation, by giving a bigger back e.m.f. than the supply voltage and needing an internal condenser to absorb some of the back e.m.f., means that the motor behaves as a condenser and therefore the current must lead the supply voltage.

Let me repeat again that the above is not an exact treatment, and that to confine "Non-Mathematician's" "rather obscure problems" to rough physical solution only would be bad from the student's view-point. While being a great believer in physical explanation of electrical problems, let me plead for the use of those "vile vectors," at least by the student.

J. Plummer, A.C.G.I.

Lee, S.E.12, *August 13th*, 1929.

"Non-Mathematician" seems to have taken fright at a really very simple problem, possibly due to the fact that leading current may seem to him to indicate an effect preceding the cause.

Let him consider for a moment, first, that the current taken by any motor is due to the resultant of the applied and back e.m.f.'s. Secondly, that in the case of a synchronous motor

the resultant e.m.f. lags behind the applied e.m.f. somewhere in the region of 270 degrees (depending upon the load on the machine and its field strength). Thirdly, that the current taken by the motor due to the resultant e.m.f. lags behind it again somewhere near, but less than, 90 degrees. This has brought the current right round and back, so as to be almost in phase with the applied e.m.f.

Now, if the load on the machine is increased, or diminished, the resultant e.m.f. will lag, or lead, about its normal position, respectively, and consequently the current will lag, or lead, in the region of the phase of the applied e.m.f. A particular value for the lead can thus be found which will bring the current in phase with the applied e.m.f. If, now, the load be decreased, the current will lead the applied e.m.f., as stated above. Alternatively, if the excitation be increased, the current will also lead the applied e.m.f.

It is somewhat difficult to find a mechanical analogy to leading current, but if it is considered that increasing the field strength increases the capacity for doing work, it would seem to have the same effect on the phase of the current as decreasing the load, or, in other words, producing a leading current.

"Non-Mathematician" would, however, find vector analysis by far the easiest way of ascertaining what is going on inside the machine and, if he has not already done so, he should consult "Alternating Current Electrical Engineering," by Philip Kemp (MacMillan). The author puts things very clearly.

Geo. Rae-Arnot.

Cupar, *August 12th*, 1929.

A Standard Intermediate Rural Voltage.

Pressures of 132,000 and 33,000 volts have been standardised by the Central Electricity Board, and 400/230 volts by the Electricity Commissioners. In order to obtain cheap supplies of materials for rural electrification work, it would be wise to standardise an intermediate voltage. My suggestion is 6,600 volts, since switchgear, transformers, &c. can now be obtained at very little cost above that for 3,300 volts, whereas, owing to the necessity for expensive oil switches, &c., there is a big increase of cost for 11,000 volts. 6,600 volts gives a reasonable radius of distribution and, as tapping costs are also reasonable, it is suitable for supply to isolated farms and hamlets, which is not commercially feasible with 11,000 volts. The adoption of 6,600 volts presupposes that 33,000 volts is the pressure of the supply to the 6,600-volt distribution system.

It is, of course, more a commercial point than a technical one, and, further, it must be borne in mind that rural distribution is a different problem to urban work.

R. Borlase Matthews.

Greater Felcourt, *August 14th*, 1929.

The E.S.C.A. and Whitleyism.

Referring to the letter appearing in your issue of August 2nd, 1929, from Mr. J. R. Smith, general secretary of the E.S.C.A., I still maintain that this association does not meet the case in its present formation. I understand that this association represents mainly the London area. I do not see why the association, when certainly it was a stronger organisation than now represented—at that date it included not only provincial municipalities but also companies—withdrew from the board in deference to the E.P.E.A. On the same principle why did not the E.P.E.A. withdraw as well as the E.S.C.A., in order to strengthen the case on behalf of the whole industry?

If the E.S.C.A. can obtain representation on the National Joint Board I have no doubt whatever that their numbers will be increased by a very considerable number of provincial members.

I may confess that I am rather surprised at the apathy of the provincial commercial staffs. I certainly expected a number of replies in support of my letter.

Non-Scriptus.

August 16th, 1929.

Researches in Circuit Breaking.

I regret to find that the British Electrical and Allied Industries Research Association is still recommending a thoroughly bad method of estimating electro-magnetic forces on circuit-breaker crossbars. I therefore hope that the Electrical Review will let me warn its readers against a method that will naturally lead to disastrous results.

The method is based on an idea of Mr. W. Fordham Cooper, which he explained "by permission of the Association" in *World Power* dated January, 1925; but, even when it can be used in conjunction with a full-size drawing, it may give results that are very seriously wrong, for it assumes that the current is "concentrated along the neutral axis," which would tell us that each side of a rectangular loop (open or closed) is acted upon by an infinite force. Mr. Cooper himself appears to have recognised that his method is open to this objection: that is to say, he appears to have recognised that the method is altogether unsuitable for application to a circuit-breaker crossbar, which is the very purpose for which the Association has been recommending it.

Supposing that the designer is sufficiently ingenious to have found a way out of this difficulty, there is still the objection that he would have to use a small-scale drawing when dealing with a large circuit breaker, and would therefore be misled by Mr. Cooper's rule for use in such cases. That rule tells us to proceed as if the drawing was a full-size one and then to multiply the result by the square of the scale, whereas (in cases to which the method is applicable) we really ought to multiply by the scale itself. This alone might cause the designer to expect a force of less than 400 pounds where he would actually get more than 3,000 pounds, leading to the destruction of the circuit breaker and the death of anyone who happened to be near it. Yet, as recently as last May, this method was recommended in the *Journal* of the I.E.E. (pp. 592-593), without the slightest hint that it required modification in any way whatever.

W. F. Dunton.

Manchester, August 13th, 1929.

[This letter has been shortened slightly.—Eds. Elec. Rev.].

Domestic Water Heating.

I was extremely interested in the articles by Mr. C. S. Davidson and Mr. R. H. Rawll in the issue of August 16th. To read statements by a supply engineer that an enthusiastic effort is being made to get storage water-heating started on a large scale is most refreshing. In deciding upon a tariff of 0.33d. per unit, Mr. Davidson goes farther than some of us even dared to hope. If a success is made of the business in Barnes at this price, then surely we shall have a tariff in the Midlands soon, even if it is a little above 0.33d. My own opinion is that the convenience of the system to consumers will support a price rather above this, if necessary, but, as a user of storage apparatus *with energy costing ¾d. per unit*, this does not prevent my feeling envious of the good people of Barnes.

I would join issue with Mr. Davidson, however, over his statement that there is little loss in the circulating system of hot-water tanks of the usual household type. I think the loss is usually rather serious, and extra initial outlay in special equipment may pay in the long run. Storage heaters, even when made with the greatest care, have appreciable daily losses when of, say, 20 gallons capacity, and they are usually mounted right above where the water is to be used, as it is recognised that the pipe losses are important. In cases where a large central heater must be used, the practice in Switzerland (where storage heating has been in use for 15 years past) is to use the shortest possible length of lagged piping of very small bore—smaller than would at present be sanctioned in this country. I think that the properly designed heater, with a minimum of pipe area and with special lagging, will show important economy in working, even though its first cost may seem rather high. But a second point of importance is this: the properly designed heater has a greater effective capacity, because it delivers a larger quantiy of water at high temperature. This is due to its smaller loss and to the better provision against mixing between hot and cold water which is usually made in it. For many household purposes water at low temperature is quite useless, and of two storage systems the one which will deliver 70 per cent. or 80 per cent. of its calories with a high intensity factor is much the more useful.

The loss from converted hot-water systems fitted with immersion heaters is mentioned by Mr. Rawll in his article, and I agree with what he says. It is a pity that Mr. Rawll has not completed the results for his household records by mentioning the number of persons in the family. The value of some of his data cannot be realised until this is known, and I hope he will agree to add this figure.

L. G. A. Sims.

Birmingham, *August 17th*, 1929.

List of Technical Institutions.

The Board of Education has just issued, through the Stationery Office, a new list (List III) of the more important institutions of technical and art education and other forms of further education recognised by it in England and Wales. The list comprises: colleges for further education, the more important art schools, technical day classes, junior technical schools, junior housewifery schools, and schools of nautical training. The postal address of each institution is given, and, for colleges and technical day classes, an indication of the courses and branches of study follows. For junior technical and housewifery schools the list shows the occupations to which the courses are related. Particulars are included of the duration of courses, numbers of full-time and part-time students, and, in the case of part-time students, the average number of hours of attendance per student. In addition, there is an indication of the approved schemes in operation for national certificates in mechanical and electrical engineering, chemistry, naval architecture, and gas engineering.

Copies are on sale at the price of 4s., or, by post, 4s. 2d., at any of the sale offices of .HM. Stationery Office, or through any bookseller.

Legal.

Holsworthy Gas and Electric Supply, Ltd.

IN Parnstaple County Court recently Mr. J. Griffiths Morgan, barrister, instructed by Messrs. Peter & Peter, Holsworthy, appeared in support of an application on behalf of Holsworthy Gas & Electric Supply, Ltd. Mr. Griffiths said that the company's difficulty was that the consumption of gas had been decreasing year by year, whereas the consumption of electricity had been increasing. Added to that, the gas plant had suffered considerable depreciation of late, and the company could not possibly find the money for repairing the plant and works. At the same time the company desired to meet the needs of the inhabitants by reducing the cost of electricity. That could be brought about if the present gas plant was removed and new electrical plant substituted. They, therefore, asked his Honour to confirm the alteration put forward by a special resolution passed on March 14th, and on April 4th last. In answer to his Honour Judge Lindley, Mr. Griffiths stated that no debenture-holder objected, and as to creditors they had all been paid. His Honour confirmed the order, conditional on the name of the company being altered by omitting reference to gas, or in such other manner as might be approved by the Board of Trade.

Telephone Disconnection Claim.

A CLAIM on behalf of the Postmaster-General for 5s. for the restoration of the telephone service, after disconnection for non-payment of an account, was heard at Brighton County Court on August 15th. The defendants, a Shoreham firm, stated that there never was any mechanical disconnection. Judge Sir William Cann held that there had been suspension, not disconnection, of the telephone service, and gave judgment for the Post Office for 1s. Leave to appeal was refused.

Published Specifications.

Compiled expressly for this journal by a firm of Chartered Patent Agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings taken.

1928.

2,500. "Electrical junction-boxes and the like." G. H. Scholes, F. J. Pearce and G. H. Scholes & Co., Ltd. January 26th, 1928. (316,232.)

2,704. "Radio-frequency amplifying circuits." W. J. Polydorff. February 5th, 1927. (284,698.)

5,166. "Clockwork-controlled electric time switches." T. Teasdale-Kay and H. E. P. Jones. May 1st, 1928. (315,738.)

5,353. "Apparatus for measuring the difference in current in two circuits." Magnetic Gauge Co. October 24th, 1927. (299,354.)

6,012. "Transmission of high-frequency signal currents over electric power lines." Telefunken Ges. fur Drahtlose Telegraphie. February 25th, 1927. (286,300.)

7,848. "Regulating systems for thermionic devices." British Thomson-Houston Co., Ltd. March 24th, 1927. (287,557.)

7,911. "Control of electric motors for driving winches and the like ship's deck machinery." J. E. Allan. March 15th, 1928. (Cognate applications 32,038/28, 37,327/28, 16,132/28 and 24,364/28.) (316,111.)

9,192. "Electric accumulators." H. Leitner. March 27th, 1928. (316,328.)

9,353. "Electrolytic condenser." H. "Andrewes, D. M. Macdonald, and Dubilier Condenser Co. (1925), Ltd. March 28th, 1928. (316,330.)

9,355. "Electric condensers." Dubilier Condenser Co. (1925), Ltd. August 4th, 1927. (295,005.)

9,386. "Microphones." Burndept Wireless, Ltd. (in liquidation), and J. H. D. Ridley. March 28th, 1928. (316,332.)

11,568. "Current magnet core for induction meters." Landis & Gyr Soc. Anon. June 22nd, 1927. (292,550.)

11,741. "Electric arc treatment of liquid hydrocarbons." Y. Mercier. April 20th, 1928. (316,336.)

11,794. "Radio antenna." Standard Telephones & Cables, Ltd. (Western Electric Co., Inc.). April 21st, 1928. (316,115.)

11,890. "Method of influencing an electric current by means of radiation." S. G. S. Dicker (Naamlooze Vennootschap Philips' Gloeilampenfabrieken). April 23rd, 1928. (316,121.)

11,918. "Attenuation devices for acoustic wave transmission systems." Electrical Research Products, Inc. June 28th, 1927. (292,970.)

12,048. "Sound-recording systems." W. E. Beatty (Bell Telephone Laboratories, Inc.). April 24th, 1928. (316,171.)

12,050. "Long-distance transmission systems with Pupin lines." Siemens and Halske Akt. Ges. April 25th, 1927. (289,385.)

12,112. "Method of and means for the electrical transmission and reception of visual images." Dr. C. Ruzicka. April 25th, 1928. (316,340.)

12,281. "Circuit interrupters." Associated Electrical Industries, Ltd. April 29th, 1927. (289,474.)

12,299. "Electromagnetic instruments of the moving-coil type, particularly microphone transmitters and loud-speaking telephones." H. M. Clarke. April 26th, 1928. (316,246.)

12,407. "Electrolytic etching machines." G. F. Johnstone. March 15th, 1928. (307,866.)

12,423. "Telephone systems." Associated Telephone & Telegraph Co. May 6th, 1927. (289,880.)

12,432. "Partitions for separating the electrolytic products in the fusion electrolysis of chlorides, particularly of magnesium." I. G. Farbenindustrie Akt. Ges. December 23rd, 1927. (302,881.)

12,502. "Telephone systems." Associated Telephone & Telegraph Co. June 20th, 1927. (292,498.)

12,536. "Transformers and circuit arrangements for use therewith." G. M. Wright. April 28th, 1928. (316,350.)

12,538. "Acoustic instruments." Soc. Française Radio-Electrique. April 29th, 1927. (289,489.)

13,174. "Thermostatic control for magnetic measuring instruments." A.C. Spark Plug Co. June 20th, 1927. (292,499.)

13,439. "Electric welding machines." W. R. Hume. May 7th, 1928. (316,360.)

14,561. "Submersible alternating-current motor-driven pumping apparatus." M. Rehse. May 17th, 1928. (316,366.)

15,488. "Train-control systems." Associated Telephone & Telegraph Co. May 27th, 1927. (291,115.)

16,302. "Asynchronous electric cascade generator." Forges et Ateliers de Constructions Electriques de Jeumont. June 18th, 1927. (292,465.)

16,698. "Cooling of electrical transformers." W. P. Digby and R. B. Fairthorne. June 8th 1928. (Cognate application 37,151/28.) (316,378.)

16,727. "Production of electric discharges at elevated temperatures." C. Epner. August 23rd, 1927. (296,019.)

16,999. "Manufacture of electric contact pins or plugs." Langendorf Watch Co. May 21st, 1928. (312,140.)

17,414. "Electric time switches." General Electric Co., Ltd., and W. Wilson. June 15th, 1928. (316,384.)

17,561. "Alternating-current rectifying devices." Patent-treuhand-Ges. fur Elektrische Gluhlampen. July 2nd, 1927. (293,300.)

17,966. "Electrically-operated brushes for treatment of the skin." Energos Ges. December 12th, 1927. (302,219.)

19,269. "Electric variable-resistance devices." Igranic Electric Co., Ltd., and A. H. Curtis. July 3rd, 1928. (316,405.)

19,481. "Time-switch mechanism." Fabrik Elektr. Apparate F. Sauter Akt. Ges. July 6th, 1927. (293,425.)

20,272. "Electric heating boilers, steam generators, and the like." Electrical Improvements, Ltd., L. C. Grant, and G. R. Wilson. July 12th, 1928. (316,416.)

20,414. "Recording means for electromotors." J. Fides. July 13th, 1928. (316,421.)

21,460. "Manufacture of accumulator plates." O. Y. Imray (I. G. Farbenindustrie Akt. Ges.). July 24th, 1928. (316,433.)

21,502. "Means for controlling electrically-driven transporting machines, such as winding engines and hoists." Akt. Ges. Brown, Boveri et Cie. August 16th, 1927. (295,650.)

21,593. "Protection of alternating-current dynamo-electric machines, and systems." Electrical Improvements, Ltd., and L. C. Grant. July 25th, 1928. (316,436.)

22,032. "Electrical distant-indicating plant and a method of adjustment thereof." Aronwerke Elektrizitäts Ges. and W. Stern. July 30th, 1928. (316,439.)

22,866. "Electrical circuit-interrupting devices." Associated Electrical Industries, Ltd. August 9th, 1927. (295,329.)

22,881. "Electric plug-and-socket connections." International General Electric Co., Inc. August 8th, 1927. (295,286.)

22,954. "Anodes for electrolytic baths." G. Monaghan. August 9th, 1928. (316,446.)

24,184. "Electrical transformers." W. L. Shaw, J. Joseph, and Radio Instruments, Ltd. August 22nd, 1928. (316,449.)

24,516. "Electric cable winches." M. B. Wild & Co., Ltd., and E. Small. August 25th, 1928. (316,455.)

25,034. "Electron valve wih indirectly heated cathode." Dr. S. Loewe and Dr. E. Roemhild. August 31st, 1927. (296,415.)

25,689. "Electrical heating elements." J. Walker and Walker, Hunter and Co., Ltd. September 7th, 1928. (316,463.)

26,244. "Switch boxes for the starter and battery ignition in internal-combustion engines." R. Bosch Akt. Ges. September 13th, 1927. (297,059.)

28,395. "Railway control systems." General Railway Signal Co. October 22nd, 1927. (299,304.)

28,665. "Electric switchgear with air blast." Siemens-Schuckertwerke Akt. Ges. October 29th, 1927. (299,700.)

28,671. "Switches." J. K. Kahaleohu. October 5th, 1928. (316,471.)

30,501. "High-speed direct-current circuit breaker." Maschinenfabrik Oerlikon. November 23rd, 1927. (301,018.)

31,633. "Mercury switches." Akt. Ges. der Maschinenfabrieken Escher, Wyss et Cie. December 6th, 1927. (301,823.)

31,663. "Apparatus for the synchronous production or reproduction of pictures and accompanying sound." Cine-Sound, Ltd. (E. Marcus). October 31st, 1928. (316,484.)

32,862. "Electric voltage indicators." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. December 19th, 1927. (302,650.)

32,863. "Train-control systems." Associated Telephone and Telegraph Co. May 27th, 1927. (Divided application on 291,115.) (300,244.)

35,015. "Analysing or synthesising apparatus for television." Telefunken Ges. für Drahtlose Telegraphie. December 12th, 1927. (302,228.)

1929.

564. "Apparatus for treatment of liquid hydrocarbons by the electric arc." Y. Mercier April 20th, 1928. (Divided application on 316,336.) (316,352.)

2,203. "Electric signalling systems." Soc. Technique d'Etudes et d'Entreprises pour l'Industrie and A. Huguenin. February 1st, 1928. (305,166.)

Trade Mark Applications.

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from August 14th :—

Excellasta. No. 503,459, and Ericella, No. 503,460 (lettering and design). Class 1. Paints, varnishes, enamels, lacquers, &c.—Ericsson Telephones, Ltd., International Buildings, 71, Kingsway, W.C.2.

Lyric. No. 500,548. Class 8. Electric meters, cables, flexible and resistances and fitted electric switchboards.—Max. Weinbaum, 419-423, Commercial Road, E.1.

Veered. No. 502,481. Class 8. Loud speaking and sound amplifying instruments.—S. G. Brown, Ltd., Western Avenue, North Acton, W.3.

The Voice of Action. No.. 503,169. Class 8. Recording and reproducing apparatus for sound kinematograph films.—The Western Electric Co., Ltd., Bush House, Aldwych, W.C.2.

Liver. No. 503,394. Class 8. Cables for electrical purposes.—The Liverpool Electric Cable Co., Ltd., Linacre Lane, Bootle, Liverpool.

Groesag. No. 497,780. Class 13. Electric immersion heaters, &c.—Fr. Gross, Jr. Gesellschaft, 23, Blendstatt Strasse, Schwabisch Hall, Wurtemburg. (British representative: M. Oppenheim, 23, Moor Lane, E.C.2.)

Vir Universal Lamp (lettering and design). No. 501,594. Class 13. Electric lamps (ordinary).—Naamlooze Vennootschap Vereenigde Industrieen Rotterdam, voorheen Ph. Verhagen & Zoon, 149, Oude Dijk, Rotterdam, Holland. (British representatives: Gee & Co., 51-52, Chancery Lane, W.C.2.)

Ferrax. No. 504,434. Class 13. Electric lamps (ordinary).—Naamlooze Vennootschap Trans-Electra, 43, Sarphati Straat, Amsterdam, Holland. (British representatives: McKenna & Co., 31-34, Basinghall Street, E.C.2.)

Toastmaster (lettering and design). No. 502,773. Class 18. Electric toasting stoves.—The Waters-Genter Co., 213-217, North Second Street, Minneapolis, Minn., U.S.A. (British representatives: White, Langner, Stevens, Parry and Rollinson, Jessel Chambers, 88-90, Chancery Lane, W.C.2.)

New Work for Contractors.

Particulars of new works and building schemes for the use of electrical installation contractors in search of work and all interested in the sale of electrical and allied plant and other products.

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

AYR.—Fire station, for Corporation; burgh surveyor.

BARNSLEY.—Additional 150 houses, Burton Grange estate; borough engineer. New block, sanatorium; borough engineer.

BENTLEY (Doncaster).—Re-erection of flour mill, Finkle Street, for Marsh & Peace.

BIRCHINGTON-ON-SEA. — Electric lighting installation, Parish Church; vicar.

BLACKPOOL.—New St. Thomas Church, Caunce Street; Austin & Paley, architects, Lancaster.

BOURNEMOUTH.—Rebuilding pier entrance (£24,000), for the T.C.; F. P. Dolamore, borough engineer.

BROOKWOOD.—Reception hospital, Brookwood Asylum; Surrey county architect.

BURNHAM (Bucks.).—Houses (32), for S. Smith.

CARLISLE.—Cinema; Percy Browne & Sons, architects, London and Newcastle-on-Tyne.

CHELTENHAM.—Rebuilding premises, 125, High Street, for John Lance & Co., Ltd.

CHESTERFIELD.—William Rhodes school, Boythorpe, for the borough E.C.; Wilcockson & Cutts, architects, 12, Saltergate (returnable deposit of £2 2s.).

COLCHESTER.—Town hall extensions, for T.C.; borough surveyor.

DEVIZES.—Electric lighting installation, 36 houses, Lavington, for the R.D.C.; clerk.

DUMFRIES.—Town hall; Sir G. W. Browne (assessor).

DURHAM.—School (720 places), Whinney Hill, for the City E.C.; director of education.

EDINBURGH.—United Free Church (to seat 600), Restalrig Road; A. L. Campbell, architect.

FARNHAM ROYAL (Bucks.).—Factory; Rheostatic Co., Ltd., 7, Carteret Street, S.W.

FAVERSHAM.—Additional 68 houses, for the T.C.; borough surveyor.

GLASGOW.—Maternity hospital (£200,000), for Corporation; medical officer. Additions, Glasgow and West of Scotland Agricultural College (£100,000); the governors. Plating mill sheds, Duke Street, for W. Beardmore and Co.

GUILDFORD.—64 houses, Shepherd's Hill estate; borough engineer.

HANTS.—Senior schools, Eastleigh and Sarisbury, and junior schools, Fareham, Purbrook and Whitchurch, for Hants. E.C.; director of education, The Castle, Winchester.

HASLINGDEN.—Further housing scheme; borough surveyor.

HERNE BAY.—Development of Strode Park estate, with electrical work; Messrs. Markwells.

HITCHIN.—Additional 100 houses, for the R.D.C.; surveyor.

HORSHAM.—Extensions, Christ's Hospital Boys' School; Henry Norris & Sons, builders, Hertford.

HUDDERSFIELD.—Shops, offices and warehouse; Norman Culley, architect, 13, John William Street (returnable deposit of £2).

IRISH FREE STATE (Navan, Co. Meath).—Alterations, County Hospital, for the Meath County Board of Health; R. Barnes, engineer (returnable deposit of £2 2s.).

LEEDS.—Alterations, Burley and Woodhouse Moor branch libraries; city architect. Roundhay High School for Girls, Gledhow Hill (deposit £2 2s.); Education Department, Calverley Street.

LONDON (Finchley, N.).—Alterations, works, Ballards Lane; Kiwi Polish Co. Shops, offices, and flats, Station Approach, Ballards Lane; W. Hollis, Church End. Cinema, Ballards Lane and The Ridgeway; Ritz Cinema and Entertainments, Ltd.

(Lambeth, S.E.).—Shops and flats, South Lambeth Road and Binfield Street; Yates, Cook & Darbyshire.

(Brixton, S.W.).—Premises, 457-9, Brixton Road; F. W. Woolworth & Co., Ltd. Premises, Stockwell Road and Broomsgrove Road; P. A. Hamilton. Eighth Church of Christ Scientist, Acre Lane; T. E. Davidson, Son and Sherwood.

(Wimbledon, S.W.). — Extensions, Technical Institute (£13,270); Surrey county architect.

MANCHESTER.—950 houses, Chorlton; city architect. Two shops and 24 houses, Westbourne Range and Essex Road, Gorton; C. H. Godfrey & Son, builders, 17, Carlton Range, Gorton. Rebuilding factory, Vesta Street, Ancoats, Clifford Whatmough, Ltd.; Matley, Brotherton and Mills, 11a, Old Millgate.

MITCHAM.—Cinema, Fair Green; W. E. Greenwood, 68, Portland Place, W.

NETHERNE.—Hospital extensions (£300,000); Surrey county architect.

OLDHAM.—Schools, Limeside estate; Education Committee.

OSSETT.—Additions, Wesley Street; Midland Bank, Ltd.

OTLEY.—100 houses, Westbourne estate; U.D.C. surveyor. Office and stores, Falcon Works; Waite & Saville, Ltd.

PORTSMOUTH.—Dairy depôt, Copythorn Road; Co-operative Society. Mental colony, Portsdown Hill; borough engineer.

PURFLEET.—Housing schemes (104), West Thurrock and Aveley, for the U.D.C.; surveyor.

RAINFORD.—Elementary school; Lancs. Education Committee.

RAMSBOTTOM.—Cinema, Square Street, for Messrs. Blakeborough, Ltd.

ROTHERHAM.—12-bay motor garage, heating chamber, and store, Lincoln Street; Rotherham Co-operative Society, Ltd. Alterations and additions, Market Hotel, Moorgate Street; R. Dewar.

SALISBURY.—Block for female patients, Harnwood Tuberculosis Hospital, for Wilts. C.C.; T. Walker, county architect, Trowbridge (returnable deposit of £2 2s.).

SELSDON.—Shops and flats, Addington Road; South Suburban Co-operative Society.

SLOUGH.—Houses (936), for Slough Estates, Ltd.; E. N. Dulley, general manager.

SOUTHPORT.—Development of estate, Churchtown (900 houses); Wignall & Ainsworth, architects, Adelphi Chambers, Hoghton Street.

SOWERBY (Yorks.).—Works extensions, for Homfray & Co., Ltd., Rose Hill, and S. Dugdale, Sons & Co., Ltd., Valley Mills.

STAINES.—54 houses at New Road, Hurlington, for R.D.C.; D. C. Fidler, surveyor, London Road, Ashford, Middlesex (returnable deposit of £2 2s.).

STOCKPORT.—Houses (78), for the T.C.; T. Davis & Son, builders.

STOKE-ON-TRENT.—Works, Garner Street, Cliffe Vale; Twyfords, Ltd.

STONE (Staffs.).—Development, Dairy Field estate; Sir Francis Joseph.

STRATFORD-ON-AVON.—Extensions, Dorsington Manor House, Bickmarsh, for H. R. Roberts.

STRETFORD.—School, for Borough Council, at Moss Lane; P. Howard, architect, 88, Mosley Street, Manchester (returnable deposit of £2 2s.). Casting shop, Elsinore Road; Muir-Hill (Engineers), Ltd. Casting stores, Talbot Road; Parkinson & Cowan, Ltd.

SWINDON.—Garage for 40 vehicles, for the T.C.; R. J. Beswick & Son, architects, 10, Victoria Road (returnable deposit of £2 2s.).

THORNE.—Concert hall; Garside & Pennington, architects, Pontefract.

TORQUAY.—Isolation hospital extensions (£9,882), for the T.C.; W. J. Jury, builder.

WEDNESBURY.—Employment exchange; H.M. Office of Works, King Charles Street, London, S.W.

WEST BROMWICH.—Fire station, with electrical work, for the T.C.; Housing, Ltd., contractors.

WEYBRIDGE.—Children's ward, for the Hospital Management Committee; secretary.

WHEATHAMPSTEAD (Herts.).—Chemical works, for Mr. Murphy.

WILMSLOW.—Housing scheme (40), near Chapel Lane, for U.D.C.; Halliday & Agate, architects, 14, John Dalton Street, Manchester.

WREXHAM.—Additional 262 houses, for the R.D.C.; surveyor.

YEOVIL.—Additional housing schemes (76), for the R.D.C.; housing architects.